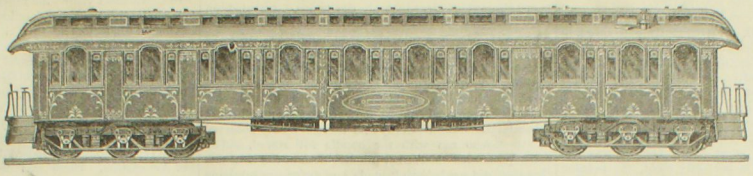
NATIONAL CAR AND LOCOMOTIVE BUILDER.



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Miscellaneous Items.

The Pennsylvania Railroad have perfected their system of car heating by steam from the locomotive. This is the result of many experiences, which were attended with great difficulties, but they claim to have at last overcome every obstacle, and have their system so perfect that it is a complete success.

Mr. Charles Francis Adams, in a letter to the Brotherhood of Locomotive Engineers, suggests that in the case of railroad employés there should be, after a term of probation, an entrance into a permanent service, in which there should be regular promotion and stated increase of pay as the period of service increases, and a pension upon disability or superannuation.

The Terre Ha ute, Indianapolis & St. Louis Railroad people are experimenting with balanced slide valves for their locomotives. They have one engine equipped with the Maurace balanced valve and one with the Booth balanced valve. All the other engines have plain slide valves, but Mr. Prescott, the master mechanic, thinks a balanced valve is becoming essential for the large sizes coming into use.

The switching crews on all trains on the Chicago & Alton in the Chicago yards have been increased to three men. A city ordinance provides that no freight train shall exceed twenty cars in length; but it is asserted that thirty-five and fifty cars often go to a train. The switchmen decided that two men could not handle such trains, and last week they sent a committee to the officials of the road asking for an increase of help, and the request was granted.

THE mechanical officers of the Chicago, Burlington & Quincy, at Aurora, are experimenting with the "torpedo exhaust" tip which appeared in the April (1887) number of the NATIONAL CAR AND LOCOMOTIVE BUILDER, after drawings sent by Mr. F. W. Webb, of the London & Northwestern Railway. They had it on one locomotive, but it made the draft so strong that they had to bore out the opening as far as the metal would allow, and yet the draft was too intense. They are now adapting it to a larger pipe in such a way as to act as an expanding nozzle.

The Brooks Locomotive Works are building a number of Mogul locomotives for the Duluth, South Shore & Atlantic Railway. The engines have cylinders 19 × 24 inches, wheel centers 50 inches diameter; 82,000 pounds on driving wheels and 16,000 pounds on pony truck, which has Thurber wheels. The engines have a diamond stack with a very large cast-iron top. Some of the first engines belonging to the order were built with extension smoke-box, but Mr. John Wilson, master mechanic, would not have any more of them because they did not clean themselves of cinders.

ONE of our correspondents says: "Your mention of lack of knowledge reminds me that thirty years ago, on the old Erie, I felt rather proud of knowing, from Clark's book on English Railway Machinery, that raising the link increased the lead on the exhaust. No other man on the division where I was seemed to understand this peculiarity of the link motion, and I got a sharp reprimand from a master mechanic for advancing such a foolish idea, and it was some moments before I thought to ask at what points of the stroke the lever could be thrown without moving the valve, and if commencement of exhaust was one of them."

Oliver Bryan received a patent for an entirely new and novel system of heating cars, the chief peculiarity of which consists in the conveying of heat from the smoke stack of the locomotive through a large pipe which passes above the dome, cab and tender to the first car, where it is received in two other pipes located immediately under the roof of the deck and on opposite sides of the car. A counterbalance damper is pivoted in the mouth of the smoke stack, which remains normally open but may be closed at will by a cord or chain attached to it and leading into the cab. Of course couplings are provided between the cars. The heat is distributed immediately under the roof, being forced downward by the currents of cool air entering through the ventilators.

IN order to make an alloy which gives great hardness and ductility to red brass, without having recourse to phosphor-bronze, a mixture of green bottle glass is recommended to be added to the other metals. To this end a pound of finely pounded glass is to be added, say, to a 50 pound crucible charge, or two per cent., care being exercised to place the whole quantity of the glass at the bottom of the crucible, while the other metals are on the top. The brass obtained is exceedingly hard, and is not easily worked, but the alloy is valuable as a mixture in making other qualities of brass, for which purpose borings, filings, etc., can be used up with advantage. If the above alloy is to be used for parts of machinery, and to be tooled, one per cent. of oxide of manganese should be mixed with the metal to be melted. All sorts of brass made with this alloy are very liquid and close grained. Porous castings become almost an impossibility when the alloy is used, even when cast in green sand.

The new cars of the New York Central Railroad, just turned out of the West Albany shops, show a great improvement in many respects over those of the old pattern. The sides have heavy panels of natural cherry, with styles of a darker wood; the ceilings are of maple panels, with cherry styles. The "racks" are of polished brass, having the same rings and facilities for holding umbrellas safely and horizontally as the drawing-room cars are supplied with. The windows are of one large plate, with no middle sash to interfere with vision, and instead of the troublesome wooden blinds with metal fixtures, which would seem to be made on purpoes to bruise your finger and thumb, the windows are supplied with dark shades with leather edges hung on Hartshorn rollers, which permit you to fix the shades at any convenient point. The arms of the slats, instead of being of metal, as of old, which are cold and which were always unpleasant to the touch, are of polished wood, fixed low and made a comfortable width, and the seats themselves, to mention last what is probably most important, instead of being iron bound or wooden edged, are entirely covered with embossed plush, so that if you choose to recline or doze there is a soft resting place for the head which does not exist in cars of the old style. The new cars have a new, very pliable spring, and they ride with remarkable ease—just as easy as the drawing-room cars do.

Parties in Montreal claim to have harnessed the cyclone to useful mechanical operations, and there is said to be millions in it. As the cyclone has been accustomed for ages to waste itself upon the desert air tearing down shanties and uprooting harmless trees, it seems right and proper that its power in that direction should now be utilized in making it do pulverizing operations under perfect control. How the cyclone force is going to be developed in the first instance is not stated, but an associated press dispatch assures all concerned that a capitalist of New York has purchased from the Montreal parties control of the invention, which illustrates an entirely new principle in mechanics growing out of the application of the natural principle developed in a cyclone. The results are said to show that iron slag can be reduced to an impalpable powder, and that other refractory substances, such as nails, can be ground finer than flour without the aid of tooth, stamp or roller. We repose the most child-like confidence in the motive power of the cyclone, for we once saw one at work, but when the reporter begins to tell us about the new principle in mechanics, all the blandishments of the invention vanish. That accomplished persuader, Mr. Keeley, lately of Philadelphia, was strong in new mechanical principles, and it was New York capitalists who helped the development of his industry. On the whole, we think New York capitalists ought to be left in undisputed control of the cyclone-new-principle invention.

Two accidents lately happened on the Pennsylvania Railroad on the same day that had very unusual but terrible features. In the first two trains traveling in opposite directions and running at the rate of 25 miles an hour, collided near Mocanaqua. One of the trains was four carloads of giant powder, which exploded with terrific force, setting fire to the cars and tearing up the track and roadbed for 150 yards. The trees in the vicinity also suffered, and some of them were torn from their roots and hurled a distance of 50 yards or more. Both engines went down the embankment and were totally wrecked. The engineers and firemen escaped by jumping. The following brakemen were caught in the wreck, and it is believed fatally injured: Louis Metz, skull fractured; Ellwood Swank, leg broken and internal injuries; James Kean, hip dislocated and arm broken, besides other injuries. The accident was caused by the operator, who gave two trains the right of way on a single track.

In the other accident the first section of a freight train broke down and the second section collided with it, instantly killing John Bouch, fireman of the second section. There were several cars of oil in the second section and they caught fire, and soon the entire fore part of the train was wrapped in flames. While the trainmen were endeavoring to subdue the fire a car loaded with dynamite exploded with terrible violence, destroying several cars, tearing up the track, and injuring the engineer of the second section and one tramp.

American Railway Master Mechanics' Association.

The following circular has been issued:

In sending out circulars of investigation, the Advisory Committee would remind the members that upon the character of the answers returned to the circulars, must, to a great extent, depend the value of the reports for next convention. Every year committees have had reason to make complaints of the limited number of replies returned in answer to the circular of inquiry. We urgently call upon the members to make complaint of this kind unnecessary in the future. It is very desirable that good reports should be prepared, but the data for the same ought to be supplied by individual members.

There are few members of the association who have not facts drawn from their practice to record, which would be of value to the whole railroad world; and in numerous instances they are kept back through mistaken modesty, or in the belief that they might not be properly appreciated. This is a mistake. Any thing a mechanical man is doing which he has not seen others doing in the same way will excite interest. We would then earnestly press upon members not to pigeon-hole the circulars of inquiry, but to answer the questions as satisfactorily as possible and return them promptly to the proper destination.

For the Advisory Committee,
J. H. SETCHEL, President.
ANGUS SINCLAIR, Secretary.

SPRINGS AND EQUALIZERS.

The following circular has been issued by the Secretary of the Master Mechanics' Association:

The subject of springs and equalizers is one that may be taken up from different points of view. It occurs to your committee, however, that the principal point for them to report on would be, if possible, to establish uniformity in the size of steel for plates, and the length of spring best adapted for driver and engine trucks of the ordinary American engines. With this point in view it is respectfully requested that each member makes as full a report as possible, accompanying the same with drawings.

SPRINGS.

First Question.—What size of steel do you consider gives the best results in locomotive driver and engine truck springs? It is assumed that crucible cast steel is used, but if not, please state what kind of steel you recommend.

Second Question.—What length of spring, from center to center of hangers, gives the best results both for driver and engine truck springs?

Third Question.—How many plates should be in each driving spring, to carry an eight wheel passenger engine, with about 50,000 lbs. on the driving wheels, or about 14,000 lbs. on each driver?

Fourth Question.—How many plates for engine truck springs with about 34,000 lbs. on truck wheels?

Fifth Question.—How much camber or set should such driving and truck springs have when free? How much when loaded with the above weights?

Sixth Question.—Do you recommend the same size of steel, and distance between hangers, for all classes of engines and regulate the capacity by the number of plates, or do you have different sizes of steel to change the capacity? If the latter, please state the advantages of that plan.

Seventh Question.—Please state your preference for the attachment of the spring hanger—slot or stirrup—and give your reasons for the preference.

Eighth Question.—What is your method of applying bands? What size of iron do you use? and is there any advantage in making the bands wider at the bottom than at the top?

Ninth Question.—Have you had any experience in the use of bandless springs?

EQUALIZERS.

Tenth Question.—What is your practice in regard to equalizers for driving springs? Do you recommend a solid bar or one slotted for a post? Please send sketch or blue print showing equalizers and attachment both in the center and to spring.

Eleventh Question.—What is your practice in regard to engine truck equalizers? Please send sketch or blue print of equalizer and attachment to truck box and spring.

Twelfth Question.—Please send sketch or blue print of what you would recommend as the best form of equalizer and attachment for a mogul or two wheel truck.

Yours respectfully,
Committee { JOHN MACKENZIE, WM. SWANSTON, J. S. PORTER.

Answers to be sent to John Mackenzie, superintendent of motive power, New York, Chicago & St. Louis Railway, Cleveland, O.

ANGUS SINCLAIR, Secretary.

Engineering and Shop Notes.

RIDING ON THE LOCOMOTIVE.

In the course of a trip from Chicago to New York over various railroads, stopping off frequently and riding in different ways, on the locomotive, in day cars and in sleeping cars, I enjoyed opportunities for observation that were very edifying to the writer, and the points gleaned may be of interest to our readers. I rode as often as possible on the engine, and on no road did I fail to obtain permission to take a seat in the cab for some part of the journey, although I noted that railroad officers are getting very strict about keeping travelers off the locomotive. This is perfectly right, for nothing should be permitted which is calculated to detract the attention of an engineer running a passenger train from his duties, and the presence of a third party in the cab is apt to do that. American engine runners have been allowed great latitude on many roads about carrying strangers in the cab, and although the tendency now is to restrain that privilege, it has been very little abused.

In early railroad days the engine runner in all parts of the world was considered a privileged character whose actions were not rigidly restricted by rules, and riding on the locomotive was practiced on all railroads at home and abroad by enterprising travelers. Up to fifteen years ago many gentlemen in Britain were in the habit of riding on the locomotive as an exciting pastime, but they carried their taste and practice considerably farther than any Americans of similar tastes were privileged to do. In the old coaching days it was considered perfectly correct and rational for gentlemen of an enterprising nature or sporting taste to take the reins and act as driver, and many a coach-load of innocent passengers have been tumbled into the ditch through the recklessness or stupidity of noble drivers. When stage coaches gave place to railways, the noble idiots who found delight in driving stage coaches, considered it was even more amusing to try their hands at driving locomotives, and before the practice was stopped by rigid rules strictly enforced against strangers riding on engines, many a railway superintendent was sorely annoyed by the privilege which influential men claimed of running the engine when they felt like doing so. Many lords of high degree used in those days to boast that they had run locomotives from London to Inverness, and nearly all drivers were ready to permit these amateurs to take the throttle lever or "regulator," as it is rightly called abroad, the understanding being that they would be solaced by a comfortable gratuity.

Some of the amateur engine drivers really learned the business of engine running, so far as regulating speed and feeding the boiler were concerned, but most of them merely got far enough to stand holding the regulator open while the driver regulated the speed by the reverse lever and attended to all other requirements of the engine. When the present Earl of Kintore was a young man, and then called Lord Inverurie, he appeared to spend the greater part of his leisure time for years riding on the trains and engines of the Scottish North Eastern and Great North of Scotland railways; and he was called a fair driver and probably could have taken a train over a division with safety without assistance from a regularly trained driver. He had a turn for engineering matters and understood the operation and construction of locomotives very well, and interested himself in all matters concerning the movement of trains. He had a scheme for applying brakes by power from the locomotive, and talked about it to all who would listen, and they were not very numerous, for in that he was ahead of his time and of contemporary railway men in Britain. Since he came to his titles, the Earl of Kintore is reputed to be crazy, which may account for the eccentric habits of his youth.

It would be something of a phenomenon to find an American locomotive engineer who would permit any one to run his engine, or to take anything to do with its management.

As I have frequently to ask permission to ride on locomotives for the purpose of observation and for the collection of information, I may remark that while a train is in motion I never attempt to speak to the engine men.

During my recent trip, I received the impression that the art of locomotive firing has improved very decidedly of late years. It is not long ago since the commonest style of firing was to shovel in as much coal as the fire-box would hold, then the fireman climbed upon the seat and reclined there till a slight clearing of the dense smoke rolling from the stack indicated that the fire was burning clear, then he would get down again and repeat the heavy charging operation. If the engine did not steam freely under this operation the nozzles were reduced small enough to "cut" the fire sharply. It may have been the influence of the extension smoke-box, which will not stand heavy firing of the stupid order; it may be that firemen are becoming more intelligent, or are better trained than they were a few years ago; but certain it is that the methods of firing locomotives have undergone a striking improvement. In no case did I see poor firing and in nearly all cases the work was skillfully and carefully performed. Light firing, and frequent firing, was the rule without any exception, and in some instances the fireman's attention was never for a moment diverted from his work.

Among the engineers I found that there was no running with the engine throttled; but this may have happened through the fact that all the trains I traveled on were very heavy, ranging from eight to fifteen cars. Eastern runners, as a rule, appear to handle the air-brake better than Western men. On one prominent road running west from Chicago, where I often ride on the locomotives, I never saw an engineer running with the engineer's valve handle on the latch; and consequently they never get the advantage of the 20 pounds extra air pressure for releasing the brakes. In my late travels I only observed two men who ran with the handle full round, and on being questioned about their practice both of the men said that they did not believe it made any difference releasing the brakes. On the roads where the time was shortest, and where prompt release of the brakes would count materially on the keeping of time, the engineers invariably ran with the handle on the latch.

A striking and readily observable feature about the various engines was the spark throwing. The extension smoke box engines were conspicuously ahead of those having the diamond stack in freedom from spark throwing, but the worst engine for emitting sparks that I rode on had an extension smoke box. The time was fast and the train heavy, and the engine kept a continual rainbow of sparks pouring down over the train; not the small kind of sparks that are shot into the air and come down dead, but lively bullet-like sparks that jumped about incandescent after they fell, and would start fire as readily as a match.

RIDING ON AN EXCURSION TRAIN.

I left Chicago on the regular morning passenger train on the New York, Chicago & St. Louis, and it happened to have an excursion party returning to Cleveland that swelled the train to fourteen cars. The engine was an ordinary eight-wheel locomotive of the Brooks build, with cylinders 17 × 24 inches and drivers 60 inches diameter. The run from Chicago to Fort Wayne is 158 miles, and is made in six hours, and sixteen regular stops have to be made, besides those at level crossings, which are numerous. The engine pulled this long, heavy train with remarkable ease, and made excellent time in the various starts. She was well handled and excellently fired, and the steam was kept constantly near the blowing point. On the level stretches she kept the train going from thirty-five to forty miles an hour, while cutting off in the 9-inch notch.

The train was densely crowded, quite a number of the passengers being unable to find seats. In this respect the Nickel Plate train was not an exception, for every train I traveled on during the journey was nearly as much crowded. The train I left Buffalo with on the New York Central had eight sleepers, and they were all so well filled that there was only a single vacant berth, and several people who wanted to get into the sleepers at Rochester had to take the day coaches. When travel is so much crowded as it is now it, demonstrates very forcibly the objections to arranging seats to hold two persons. There are always some selfish persons on a train who will entrench themselves in a whole seat with grips and other impedimenta, and nothing but peremptory orders from a conductor will persuade them to yield up a share of the seat to another. The more general introduction of the chair type of car seat will prevent a great deal of friction among travelers.

There are a great many excursion trains on railroads at present, yet they do not appear to be popular even with the people who patronize them, if I am to judge by the expressions heard on all sides on the train between Chicago and Cleveland. The Chatsworth disaster is still fresh on people's minds, and the crowded state of this train appeared to make the passengers think that danger of a similar accident existed. There were two conspicuous elements on the train. One part followed the example of Dick Swiveller and fanned the flame of hilarity by passing the bottle; the other part moved round in nervous dread and kept pestering all and sundry with inquiries about the probabilities of an accident. But the train pushed along in fairly good style, and all the crowd was landed safely, as thousands of similar crowds are landed daily.

There were some rather amusing scenes in the refreshment rooms at Fort Wayne. By the time the train reached that place everybody appeared to be intensely ready for dinner and a rush was made for the dining room and lunch counter. The dining room was filled in an instant, and there were no waiters to supply the people with victuals. Some pushed into the kitchen and helped themselves, and others added to the crowd at the lunch counter where chaos prevailed. A lady and two daughters, evidently refined people, sat beside me at the table and dined like myself off bread and butter and tepid water. The only variety to this was a compound which resembled hash, but tasted like fish balls. The only attention bestowed upon the hungry excursionists by the people of these rooms was in the collection of full payment for dinner and a hard visaged woman looked strictly after this duty, although she turned up her nose at every one who asked her to get them something to eat. The dining rooms at Fort Wayne want reforming, and, in this respect, is by no means exceptional among establishments of its kind.

IN CLEVELAND.

In Cleveland I visited the railroad offices and had enjoyable chats with the general officers of the various roads having headquarters in that city. The subjects of car heating and car coupling are exciting conspicuous attention, and all the leading railroad men appeared interested in hearing the latest news on these subjects. The leading question asked in nearly every instance was: Is the letter ballot going to carry? So far as I could judge from the conversation in the various offices, the roads with headquarters in Cleveland are not going to give a very hearty support to the type of coupler proposed by the Master Car-Builders' Association. There was decided unanimity among the managers that the stove as a means of car heating must go, and the favorite substitute is steam from the locomotive.

LAKE SHORE REPAIR SHOPS.

The repair shops belonging to the Lake Shore & Michigan Southern, at Cleveland, are of rather ancient origin and were not planned to meet the modern requirements connected with getting out work on a manufacturing basis; but like many other inconvenient shops they have to be kept running till the time comes when the company are ready to provide something better. Those who have visited the shops a year ago and now, will, however, note great improvement in the appearance of the place, and in the way work is got out under the vigorous management of Mr. J. S. Graham, master mechanic. Although the road is doing an immensely heavy business both in passenger and freight traffic and the locomotives are very hard run, they all look well and are evidently kept up in first-class order. Mr. Geo. W. Stevens, superintendent of motive power, who is allowed to be one of the ablest men in his line in the country, does not believe in running debilitated engines; he does not believe it pays, and consequently the practice followed in all the shops of the road is to keep all the motive power in as good order as comes consistent with the wearing out of material. As followed here, the policy of keeping engines in good order does not mean the forcing of them into the shop prematurely, for the average mileage of passenger engines between the turning of tires is 100,000 miles; but the running repairs are so evenly maintained, that when the engine must go into the shop for such repair as the turning of tires or the cleaning of boilers, all the leading parts are just ready for an overhauling, light or heavy, according to the extent of service. It is a great matter to carry out running repairs judiciously. One passenger engine on this road has run over 200,000 miles since the tires were turned, and is still in service. No light service, either, for the trains pulled are as heavy as any thing carrying passengers in America.

In the roundhouse connected with these shops, they have a drop table in one of the pits, which Mr. Graham considers of great advantage in facilitating repairs. The time I was there, they had a switching engine over it, and had a driving axle box down re-babbiting. By the aid of this pit, the work could be done in about one-third of the time that would have been required in jacking up. Devices of this kind are often highly valuable, in permitting the work to be done to an engine so promptly that she does not need to lose a run to have repairs made. When motive power is scarce and business heavy, this is often worth an extra engine or two.

Diamond stacks have been used exclusively as spark arresters on the locomotives belonging to the Lake Shore road till last week, when one engine was equipped with the extension smoke-box. Mr. Stevens has been very conservative about making a change in this direction, and he has watched carefully the performance of engines with all kinds of spark-arresting devices, with the result that he is now ready to give the extension smoke-box a fair trial.

They take exemplary care to prevent loss of heat from the boilers and cylinders of their engines by radiation. The sides of the fire-boxes and boiler heads are carefully lagged, and the cylinders are not only covered with a good non-conducting material, but the covering is extended entirely across beneath the cylinders protecting the lower portion of the castings from chilling influences.

They have a very fine type of six-wheel switching engine in use on this road. The cylinders are 18×24 and the wheels 48 inches diameter with sufficient weight upon them to prevent slipping readily. The engines can handle easily any train of cars ever put on to them. They have the American brake on drivers and tender and the officers speak highly of its convenience in handling heavy trains. Some time ago they experienced considerable annoyance from the piston rods of the brakes on these engines getting bent. After considerable watching, Mr. Graham discovered that it was caused by lost motion wearing between the engine and tender which jerked the brake gear violently and bent the rods. Care in preventing lost motion at the point mentioned ended the trouble.

They had a curious experience here with tool steel lately. A drummer came round with authority to have a piece of his steel tried, in competition with one of their ordinary wheel lathe tools. A tool was made out of the drummer's steel, and at his request was used with the heaviest feed it could stand. It turned a tire in 2 hours and 55 minutes. An ordinary tool was then tried on the other tire and forced as fast as it would stand, and it took 5 hours and 30 minutes the best it could do to finish the

tire. Mr. Graham is now hankering after a supply of the steel that rushes the work.

THE BROOKS LOCOMOTIVE WORKS.

I stopped off at Dunkirk, N. Y., and spent two days examining the Brooks Locomotive Works, which are located there in a square conveniently situated near the Union depot. These works are excellently situated for convenience in receiving material, and they have ample room for buildings and tracks inclosed within fences that protect the property and prevent surreptitious entrance or exit. They have been making extensive improvements on the buildings lately. A new blacksmith shop 75 × 209 feet has been put up over the old one, and a new hammer shop has been erected 75 × 235 feet. The machine shop has been extended 70 × 166 feet on one side and 30 × 184 feet on the other side. All this work has been carried on without interfering with the machine work of the establishment, which never was so much crowded as it has been this summer. They are improving the erecting shop by putting on a new iron truss roof, which carries overhead traveling cranes arranged for lifting all the material used in erecting the engines. A large new boiler shop was put up last season. It has a Yale & Towne overhead traveling crane which handles all the work. This department of the works is provided with an exceptionally good plant of tools suitable for facilitating boiler work, among them being a hydraulic riveting machine, which is kept constantly at work. They follow the somewhat unusual practice here of putting the rivets in from the outside and having the hammered end inside. Mr. J. H. Setchel, the able superintendent of the works, speaks in the highest terms of advantages of the practice. It is obvious that riveting done in this way will close the rivet hole more effectually than the head would, and so prevent leakage into the seam. Their practice of hydraulic riveting is perfectly satisfactory, and the work is done very rapidly. I observed in watching the men operating the hydraulic riveter, that they kept the pressure of the ram on each rivet for about five seconds after it was applied. That is very important as a means of securing good work from a hydraulic riveting machine. Some years ago great complaints were made of the inferior riveting done by the hydraulic riveting machines used in the ship building yards of the Clyde and other iron ship building centers, and threats were made by the Board of Trade officers to refuse to pass work done by hydraulic riveting. The work was all done by contract, and the men in their anxiety to turn out work rapidly, never gave the rivet time to set before the ram pressure was released; the consequence was that the sheets would spring slightly apart and a bad seam would be the result. The trouble was effectually stopped on the Clyde by an attachment to the riveting machine which was invented by Mr. Robert Hardie, lately superintendent of the New York Locomotive Works, and then in the engineering department of John Elder & Co. The device acted to hold the ram closed for five seconds after the pressure was applied. It was automatic, and the boilermaker could not turn out inferior work.

They have lately added many new machine tools to the shop equipment and changes made in the arrangement of the buildings will greatly simplify the handling of work and material. The supply tracks bring in rough material to points where it keeps moving forward by constantly advancing stages till it reaches its place in the finished locomotive. All the iron required for the blacksmith shop, hammer shop, boiler shop, foundry and supply storehouses is brought to the unloading points by the cars on tracks that are arranged to prevent duplicate handling. Coal and all other supplies are brought in in the same way. When a cylinder is ready to leave the foundry, it is taken by a narrow gauge track to the part of the machine shop where the boring mill and planer for that kind of work are located, and each operation done brings it a few steps nearer the engine where it belongs. So soon as the frames are forged in the hammer shop, they are run directly into the nearest part of the machine shop which contains the frame planers and slotters. All the other work is handled on a similar plan, and there is extremely little handling done that does not receive the aid of power or labor-saving appliances.

They have an excellent system of templates for maintaining sizes of work in duplicate, and the system is well kept up, the best measuring instruments and small tools of standard sizes being employed to secure uniformity.

Among the new tools lately received is a Sellers tool grinding and shaping machine, which they are working into use for grinding all the machine tools used in the establishment. Mr. E. Nichols, president of the works, has high expectations of the time-saving capabilities of this tool. In trying to explain the design and purpose of the machine I can not do better than quote an admirable description of it that appeared in the *American Machinist* a few weeks ago:

"A grinding wheel is mounted in a cast-iron frame, forming a large tank which receives the water used for flooding the tool in grinding. The machine is also provided with suitable shields, which will prevent the throwing of water on the working parts of the machine, the floor or the operator. The water for flooding the tool is supplied by a brass rotary pump, which is driven by a round belt from the machine countershaft. It is provided with a jointed and counterbalanced nozzle, which may be set in any position required, to deliver the water on the tool to the best advantage. Slide rests are provided, by which a vertical and two horizontal motions at right angles to each other can be imparted to the tool-holding chuck. The slide rests and chuck are carried upon a vertical slide of square section placed in front of the wheel and working in a covered bearing, and counterbalanced by a massive spring, so that the vertical slide may be moved up and down by a long lever which is operated by the left hand of the attendant, the object of this movement being to move the tool in a vertical plane up and down past the grinding surface of the stone, and thus produce a plane surface on the tool. It is evident that if the tool were held at a convenient height and fed against the stone without other movement, the surface would conform to the surface of the stone, and as the bearing increased the cutting would become less rapid; hence, in grinding straight surfaces, the chuck and slide rest, etc., are moved vertically, as described, as well as horizontally. In grinding curved surfaces no vertical movement is given to the chuck holding the tool, but it is made to rotate to produce the curve desired. If the curve of the tool is not a circular one then a "former plate" is required. Means are provided by which any sample tool, whether ground by hand or otherwise, can be used as a template for grinding the "former plate," to be afterwards used for the reproduction of the shape of this sample tool. The preparation of necessary formers for a variety of peculiar curved shapes is not a matter of much expense, as these formers simply consist of small cast-iron plates ¼ of an inch thick, and quickly shaped in the machine.

The chuck which holds the tool can be rotated in two planes at right angles with each other, and the exact amount of rotation in either plane is indicated by graduated circles and verniers, so that any desired angle of tool or of clearance can be accurately obtained.

For grinding the curved face tools, the former plate is first selected and placed in the machine. Then the tool to be ground is placed in the swinging chuck with the base of the tool towards the left and pushed forward against the end gauge until the index finger of this gauge points to the number given in the table plus the amount required to be ground off the tool, remembering that each graduation represents $\frac{1}{64}$" on the tool. Clamp the tool in the chuck; swing the chuck so that the entire curve of the tool will rub against the end gauge, note the oscillation of the index finger and adjust the chuck by means of the handle on the left, until these oscillations are reduced to a minimum. The tool will then be in the best position for grinding.

For grinding lathe, boring and chasing tools, planer hook tools, and slotting splining tools, supplementary chucks are used and set to the angles given for corresponding straight tools.

The periphery of the grinding wheel is not at right angles to the flat surfaces of wheel, but is formed so that in the section the grinding surfaces will form a V containing an angle of 90 degrees. With this shape of stone a vertical surface perpendicular to the axis of the stone can be ground by moving horizontally the chuck with tool toward the center of wheel; then, without disturbing the tool or making any change whatever, a vertical surface at right angles to the former surface can be ground by moving the tool horizontally in a direction parallel to the axis of the wheel.

The intention is to permit no workman to grind the tools he uses. He must take everything to the tool room where this machine is located, and there he will receive duplicate tools always kept ready. The tool dressers' fires are located beside the tool room convenient to the grinding machine.

They do a great deal of finishing and other work by grinding in these works, and have an excellently equipped room where all the grinding is done.

They have lately established a testing department in the works, and the intention is to subject samples of all material used to careful physical or chemical tests, so that the quality may be beyond question. A great deal of contract work is done, and a very good system is in use throughout to locate the responsibility for work that may be questioned. Each foreman fills out a blank certifying to his inspection of all finished work, and giving the names of the men engaged on the various operations. The following is a specimen: J. H. Setchel, *Supt.* Dear Sir—I have personally examined the fire-box, flues and stay bolts of engine No. 11, order x, and I find them in good condition. Flues in back end set by Thomas Brown; flues in front end set by John Donovan; boiler put out by John Wilson. (Signed) Frank Gleason, *foreman boiler shop.* Blanks regarding all other kinds of work are kept on hand and filled up in a similar manner.

Mr. Nichols, the new president of these works, is interesting himself warmly in the success of the night school for the education of apprentices and workmen, and Mr. M. L. Hinman, secretary and treasurer, is a good friend of the institution. They have a very finely furnished school room, good teachers and every facility that can make the road to knowledge easy. Since I visited the place last, they have got a Richardson valve motion model which has proved an excellent means of instruction. Most of the boys find studying valve motion by the aid of this model more interesting than mathematics or even drawing.

Among the orders the works are busy on are some eight wheel engines for the Chicago, Rock Island & Pacific Railway of the style usually built by Mr. T. B. Twombly, general master mechanic of the road. The engines have straight boilers, and arched crown sheet of fire box secured by radial stays. Like all Rock Island locomotives these have the diamond stack and common front, and all the engines are equipped with No. 8 Mack non-lighting injectors, Nathan sight-feed lubricators, Ashton blow-back and safety valves, a water glass set almost in the middle of the boiler head, Morse balanced slide valves and a combined relief and pressure valve on the steam chest.

A group of mogul engines, for the Flint & Pere Marquette Railroad, give evidence of careful and able designing, and are highly creditable to Mr. T. J. Hatswell, master mechanic of the road. The cylinders are 18 by 24 inches, and the driving wheels have 50-inch centers. The boiler is straight, 56 inches diameter at smallest ring, has 206 flues 2 inches diameter and 11 feet 2 inches long. The outside shell of the fire-box is bent to a true circle, and the fire-box crown is secured by radial stays. All the seams are double riveted, and the rivets are set parallel, instead of being staggered as usual. An extension smoke box is equipped with the spark arresting appliances, and these are aided by a brick arch in the fire-box, which is supported on water tubes that pass into the crown sheet. The bends of these tubes are so arranged that the movement due to expansion and contraction can take place without tending to break the tube. The boiler and fire-box are Otis steel throughout, the outside shell being ½ inch thick. The engines are equipped with two monitor injectors, Nathan lubricators, and American steam brake, with Ross brake-shoes. The pony truck, which has Thurber steel wheels, is equalized with the front driving springs.

The remainder of my notes during the journey, which were taken at the Wagner Car Shops, Buffalo; the West Shore Railroad shops, Buffalo, and the Schenectady Locomotive Works, Schenectady, must lie over to another issue through want of space. A. S.

Barbarism in Iowa.

SOME CURIOUS PEOPLE WANT TO SEE A RAILROAD WRECK AND DO NOTHING TO PREVENT ONE ON THE B., C. R. & N.

Our readers will no doubt be shocked as well as surprised to know that there are certain people residing not more than fifty miles from Cedar Rapids who are so lost to all sense of feeling and responsibility as human beings as to coolly and quietly stand in the doorways of their homes and see a railroad bridge burning, knowing to a certainty that a train was bound soon to reach the opening and dash into the ditch, and who are so entirely destitute of all the instincts of humanity as to, when called to account for not doing something to avert a disaster, admit that they had seen the bridge burning, and had done nothing to save it, or to signal the train, but were waiting there quietly "to see a railroad wreck."

This occurred on the Decorah Division of the Burlington, Cedar Rapids & Northern on Wednesday last, when the south-bound passenger train in the evening of that date, it is supposed, set a bridge over an opening from four to six feet deep, on fire. In the vicinity there were at least five or six farm houses, from forty to eighty rods distant from the fire, some of the occupants of which saw the smoke and flames without doing any thing to stop the fatal work. A serious wreck, which no doubt would have resulted in disastrous consequences to the enginemen, and destruction of property, and imperiled the lives of those in the way car, was only averted by the prompt action of a stock shipper at Maynard, who, while driving home, sought shelter from the rain near the scene, and when told of the fire, hurried on to Maynard in the midst of the storm, when the agent was notified and the necessary orders issued to protect all trains. Had it not been for this warning, darkness would have overtaken the train on its journey, and as the rain had put out the flames, the opening would not have been perceptible in time to prevent an accident, and the civilized farmers of Fayette County in the vicinity of the fire would have had their curiosity gratified in seeing a railroad wreck, and probably some dead bodies carried from the scene. It would seem to us that such entire heedlessness of human life is appalling, and that such people are a disgrace, not only to Iowa, but would be a stigma even in a country without the slightest remnants of civilization.—*Cedar Rapids Gazette.*

Shocking and disgusting as the barbarous apathy described in the above article appears, the case is, unfortunately, by no means uncommon. There is no doubt but one or more farmers in the neighborhood of Chatsworth saw the bridge burning that caused the late horrible accident near that place, but they appeared to be strangers to the sentiment of humanity which seeks to prevent suffering in any form. These people evidently were callous to any form of misfortune so long as it was not likely to reach their own persons.

A cablegram lately brought to the American reading public the somewhat startling announcement that the heating of the springs under the railway carriage in which Queen Victoria was traveling compelled the train to stop. This is evidently a new disorder to railroad rolling stock, and it is to be hoped our Anglomania friends will not do any thing to introduce it into America.

Communications.

Valve Motion—Canadian Pacific Railway Consolidation Engine.

Editors National Car and Locomotive Builder:

While criticising the bearing surface of pins in the motion of these engines the commentator has fallen into error as regards the eccentric rod pins, and as the article seems only to have been written with a view to call attention to these, I am somewhat surprised that the writer allowed himself to draw such an inference, as a practical engineer would at once pronounce absurd.

The section of pin shown is only the bolt holding the sides of the eccentric rod jaw together. This bolt is fitted with a hardened steel bush, fitting tightly between the sides of the jaw. This bush forms the bearing surface, and can be replaced at any time with a very slight delay and expense.

The drawback to motions with 2 inch solid pins and the dimensions and weight of parts to suit are sufficiently well known to all practical men to induce them to be avoided where possible.

As details are made from separate drawings in C. P. R. shops, it is unusual to show the minor features on an "arrangement" drawing. If it had been thought that the details were to be commented upon when the request was received for the motion arrangement, fuller information would have been supplied. F. R. F. BROWN.

The following is the criticism referred to which appeared in the *Gazette* of Aug. 12.

"The bearing surfaces might be increased with advantage. The eccentric rod pins are especially small. The present writer has used pins 2 in. diameter for all engines with cylinders 18 in. diameter and upwards and found that the increased bearing surface greatly prolonged the life of the pins and links. The larger pins are of course more expensive in first cost, but are far more durable, and the smaller amount of slack or slogger produced by wear conduces to a better distribution of steam."

Encourage the Education of Engineers.

Editors National Car and Locomotive Builder:

"Educate Engineers" heads an article in your journal of April, 1887. The advice there given, if only accepted by those it was intended for, would certainly give to our different railroads better engineers than those they have at present. A fireman of the present day is an apprentice and is looked upon as the future engineer, and the lodge room should be the place, not to discuss how much compensation they should receive for their labor, but how to improve themselves so they can earn the compensation they expect when they become engineers.

However, the qualifications of an engineer are for the company who employs them to decide, and if the different railroad companies would establish certain rules, the firemen's lodge room would soon become a place of instruction as how to become engineers. And while the master mechanics' organizations have made long strides in the improvement of the locomotive, it appears that the question as to the qualification of those who are to have charge of this improved machinery has never been brought before their convention; when in fact it is just as essential to have first-class engineers as it is to have first-class machinery. There appears to be one road, however, in this western country which has all mechanically trained engineers, and take them as a whole, the same number of intelligent men representing this part of the service can not be duplicated by any other railroad in this country. And this comes altogether from the rules established governing the locomotive branch of their service. I will not go into details relative to this matter, but merely give the leading features. To begin with, when a young man desires a situation as fireman, expecting to become an engineer, he must make written application in his own hand writing; he must also bring reference as to his character. If his application is considered, he is invited before those desiring his services. He is then examined as to the extent of his education, of which he must give a practical illustration in mathematics in their presence. Of course, other branches must be equal; in fact, he must have a good common school education. If they decide to employ him he is taken on trial. If he proves himself to be the material they require, he is kept as a regular fireman. At the end of two years continuous service he may make application for promotion as an engineer. If the company are in need of engineers, he is called before the board of examiners, consisting of the head of the mechanical department and his assistants. I have not the space to give all the questions that are put to the applicant, suffice to say that the candidate must prove that he has a thorough knowledge of the machine he is expected to take charge of. He must give the construction of boiler in detail the breaking strain of different size bolts, how to set valves, lay off a quadrant, how to use his steam economically, breakages of different parts, and how to bring a disabled engine to shop under steam, etc. In fact, with some of the applicants the greater part of a day is consumed; in case there is a failure to pass, he is sent back to firing and to study until he thinks he is able to try again when he is given another chance, and by this method the oldest in the employ does not have the preference without he merits it. Machinists who have served their apprenticeship with the company must comply with the above rules, and also as to the length of time of firing, same as others. These rules being closely observed, it is peculiarly inviting to a class of men generally above the average found on most of railroads, and those who have exerted themselves and been faithful to the company do not always stop at locomotive engineers. They can aspire to any position within the gift of the management, for they are just as liable to be called on for something higher as those in other departments of the service.

I should have mentioned that after passing a successful examination in the mechanical department, the candidate must also pass before the board in the transportation department as to his knowledge of train service. If successful then he is given charge of a locomotive on trial. After a certain time, if he is a success, he is given a certificate as a first-class engineer.

If the Master Mechanics in their next convention would bring this matter before that body I am satisfied it would have many advocates, consequently let them get up a code af rules such as I have mentioned, that all applicants for the position of firemen, after a certain date must conform to, and you will soon see the firemen's lodges turned into a school room. W. W. W.

Finlay's Center-Support Truck.

Editors National Car and Locomotive Builder:

Although I sign *yes* to the 60,000 lbs. M. C. B. axle for the two-truck system, I firmly believe a central truck for all cars loaded above 40,000 lbs. would be true economy in the long run. Our line connects with the I. M. & Southern Ry. just 103 miles north of the Texas line, a good point to observe the passing cars from nearly every road in the country on their way to and from Texas, Mexico and the Pacific coast. An average of 500 freight cars pass here daily. Amongst them you will see the old Eastern 12 ton and modern 25 and 30 ton cars. Many of the old cars that never will return, and not a few of the modern 25 and 30 ton cars that show at this early time that it would have been economy in the long run to have adhered to the 3½ in. diameter M. C. B. journal and truck, and to have adopted the centre-support truck for all cars above the 20 ton capacity.

The deepening of the truss to carry the load while the car is at rest works well, but by observing those cars when they are loaded and after they have been pounding and plunging over 3,000 or 5,000 miles of rough road-bed, the observing eye sees the sagging car center and concave roof-top with the truss washers constantly embedding themselves into the end timbers, and the wheel flanges already showing that the trucks have had hard work to relieve themselves of the excessive side thrust that the heavy-loaded 34-foot cars imparted to them, and how will it be with the track after a few very wet months? The increasing low joints and spreading rails will still admonish us that the cost of a center truck would have well paid for itself. There is no difficulty in making two trucks strong enough to carry such loads, but no matter how strong the truck may be, the same trouble will exist between the track and the two-truck system on heavy loaded cars. The pivoting of the load on the center support truck relieves to a wonderful extent the flange wear, and also the excessive shock at low joints. Four years' service of center support cars has proven this to the companies that have them and are still adding to the number in use.

L. FINLAY, Hot Springs R. R.

MALVERN, Ark., Sept., 1887.

Reported Air Brake Failures.

Editors National Car and Locomotive Builder:

All must certainly admit the justice of your remarks in your editorial in last month's issue upon "Reported Air Brake Failures," and of your criticisms upon the neglect of many roads to properly instruct their employés in the care and management of air brakes. Undoubtedly, it is in a great measure a question of discipline and management, but could you not go a little farther in suggesting a remedy, and recommend the adoption of devices which shall provide against instances of neglect which will happen to the very best men at times?

Efficient steam brakes upon the driving and tender wheels, deriving the power direct from the boiler, and not dependent upon any intervening mechanism, would, in some instances, prevent disaster.

They may be arranged for use in making every stop, in conjunction with the air brake on the coaches, by the employment of a common valve handle, or held in reserve for use in an emergency, when the engineer finds his air brake does not work. Suppose the supply of air is exhausted from any cause such as you mention in the middle of a trip, would not a reliable steam brake, as above mentioned, give the engineer greater confidence in controlling his train to the end of his division? I admit that the driver and tender brake operated by air would avert such mistakes as forgetting to open the cock controlling air supply to the train, but there are instances where the supply of air is exhausted, thus rendering the air driver brake useless, while if the engine brake is always operated by steam there can be no lack of power whenever its use is required.

However rare may be the occurrences of such instances, the fact remains that *they do sometimes happen, and may happen when brakes are most needed*, hence it is surely the part of wisdom to provide against even such a contingency, if possible to do so. I inclose you copy of circular which our company has just sent out on this subject.

Very truly yours,

JOHN B. GRAY, Vice-President.

A Locomotive Speed Indicator.

HICO, Tex., Sept. 15, 1887.

Editors National Car and Locomotive Builder:

GENTLEMEN: In the June number of '85 of your journal, there appeared an article in which you called the attention of inventors to the need of a speed-recorder for locomotives. You stated that numerous attempts had been made to produce a practical instrument, but that all had possessed defects which rendered them worthless. You did not point out the defects; but you thought that he who could overcome the difficulties would prove a benefactor to railroads and would be richly rewarded.

At first I fell into the error of the others, as I afterwards learned through corresponding with Munn & Co. and with the Crosby Steam Gauge Co., of Boston, the latter having been interested in no less than four attempts to produce a practical device for indicating speed of locomotives, without success. They, however, thought that a successful speed-indicator would be likely to command large sale. The American Steam Gauge Co., of Boston, were also of that opinion.

The fact that so many minds, both in Europe and in this country, had been directed to the subject, stimulated me to make another effort: and, as the result, I believe that I have produced a device that will give entire satisfaction.

The general plan had been to have a certain number of revolutions of an index within a given time indicate speed; but no continuously revolving index can be made to indicate speed accurately; moreover, that plan necessitated continual reference to a timepiece, required close attention, and involving more or less mathematical calculation, often perhaps to the neglect of more important matters. These objections were of themselves sufficient to condemn the plan; but there were others still quite as serious. It was necessary to connect the apparatus with a friction roller revolving by contact with the rail or with the tire of a driving-wheel, or connection had to be made with some part of the running gear. If worked by a roller running on the rail, the gearing and supports had to be heavy and strong, to withstand the shock incidental to that position; if worked by connection with the running-gear of the engine, the slip of the drivers, under certain conditions of track and load, would cause the indicated speed to be greater than the actual speed. My device surmounts these difficulties. A dial is divided into equal spaces representing miles. An index passes once around the dial in indicating a range of velocity from one to eighty miles per hour. The index will point to the number representing the speed which the engine is making, and will move forward or backward as the speed may be increased or diminished. Simply a glance at the dial will show the engineer the exact speed of his engine, and enable him to regulate the flow of steam to the cylinders, as the steam gauge enables him to regulate the quantity of heat to be applied to the boiler.

I call the instrument a speed indicator, because it simply indicates and does not record. The recording feature could be added, but it would complicate the mechanism, and increase the cost without any practical gain.

W. J. BORDEN.

Extended Smoke-Box and Smoke-Consumer.

Editors National Car and Locomotive Builder:

I quite agree with "Laboratory" that the extended smoke-box has nothing to do with preventing smoke, but yet, changes are made in connection with the adoption of the long smoke-box which do aid combustion.

Any one who has adopted the extended box has noticed, if he has given attention to the matter at all, that there is less smoke than when the diamond stack was used, and probably for this reason some have fallen into the mistake of attributing it to the extension, when really the open stack which is always used in conjunction with the extended box should be credited with the improvement.

With the adoption of this form of stack, it matters not whether the smoke-box be short or long the result is equally the same—less smoke—and this without any change whatever having been made in the fire-box arrangement. The free exit of the draft from the open stack favors complete combustion, whereas the obstruction to the draft in the diamond stack is a hindrance. A. A. M.

William J. Murphy, recently superintendent of the New York, Lake Erie & Western Railroad, has been promoted to the general superintendency of the company. He is not yet forty years old, but has been in the service of the company since 1862, when he was a messenger boy at Susquehanna. He soon became a telegraph operator, and from that time his advance has been steady. His present promotion, like previous ones, has been earned by faithful attention to duty. A few minor changes will result from it.

Car Heating for the Coming Winter.

The hot weather of this summer must have proved very distressing to those who had to go round talking up methods of car heating, for the average railroad man dislikes to discuss any thing but methods of keeping cool when the thermometer stands daily in the neighborhood of 90; yet our letter files show that the subject of heating cars during the coming winter has been kept steadily in the foreground. We have received a good many letters asking what the leading roads were doing in this direction, and in the various calls we made at railroad offices the subject was frequently broached, showing that the interest in the subject aroused last fall had not subsided. In order that we might be able to furnish our readers with trustworthy information as to what was going on in regard to car heating we interviewed all the railroad managers within our reach, and we addressed letters of inquiry to one hundred and twenty others, the whole representing all the roads of any consequence in the United States and Canada. The replies have come in very freely. Quite a number of those sending answers request that their views shall not be made public, but a great many railroad managers give their views quite plainly and are ready to stand by their convictions. Nearly all railroad managers agree that something better than the common stove is necessary to heat cars safely, and there are very few who are not experimenting with superior methods. The various forms of continuous heating by steam have many friends and advocates, and a large number favor an independent system of safe heating as represented by the Baker and other hot water heaters.

Among the answers received, Mr. A. A. Jackson, general superintendent of the New York & New England Railroad, writes:

"We intend to heat our cars by steam, and have given an order for ten cars to be fitted up as soon as possible. Experiments seem to be in that direction everywhere."

Mr. H. Stanley Goodwin, general superintendent Lehigh Valley Railroad, writes:

"Answering your letter of Sept. 5, I would say that we have not fully decided upon any change in the heating of our passenger cars, but have the subject under consideration."

Mr. J. W. Hobart, general manager Central Vermont Railroad, writes:

"In reply to your favor of the 5th inst. permit me to say that we have not yet decided upon any particular car heater. We have one train already fitted up with the Williames plan of heating by steam from the locomotive; we have engaged to have another fitted up very soon with the Martin plan, which the N. Y. Central R. R. have adopted, and still another called the Wilder system. The best plan for this purpose has probably not yet been presented, as all we have tried seem to have serious defects. Should any thing come within your notice that seems desirable we should be glad to hear from you upon the subject."

Mr. T. F. Oakes, general manager Northern Pacific Railroad, writes:

"In response, I would say that this company has for some time been making experiments in the matter of heating passenger trains, and has recently consented to the equipment of 15 coaches (experimental) by the Safety Heating and Ligbting Company, represented in this city by Mr. F. M. Wilder."

Mr. C. W. Smith, first vice-president Atchison, Topeka & Santa Fe Railroad, writes:

"In reply to yours of the 1st, which has just come to my attention, will say that this company has arranged to use what is known as the 'Emerson device' for heating passenger cars with steam obtained direct from the locomotive; and that system is now being applied to many of our coaches preparatory to being used on some of our trains whenever cold weather sets in."

Mr. F. W. Cram, general manager New Brunswick Railway, writes:

"It is our intention to try the 'Sewall' heating process upon our through express trains."

Mr. J. W. Miller, general manager New York, Providence & Boston Railroad, writes:

"We are equipping one train with the Martin anti-fire car heater, known as the 'Martin system,' and another with safety car heater known as the 'Wilder system,' to test one against the other to see which is the best, and may also try some others."

Mr. Geo. E. Merchant, general manager Buffalo, Rochester & Pittsburgh Railway, writes:

"Referring to your letter of Sept. 5, will say we are going to heat our coaches with steam."

Mr. W. N. Truesdale, vice-president Minneapolis & St. Louis Railway, writes:

"Answering your favor of the 5th inst., would say that we are considering a proposition made us by the Safety Car Heating and Lighting Company, of New York City, for equipping some of our passenger train cars with their devices for heating such cars.

"Theirs seems to be about the best device that, so far, has been brought to our notice, but it is not without certain objectionable features.

"So far as my own observation goes, I do not think there has any system of heating cars by steam been presented, as yet, which is superior to the Baker heater, all things considered; and with the improvements I understand have been made with this heater, I do not believe there is any thing that can be much safer in case of accident, nor from which there will be less danger from fire.

"So far as I can recollect now, I cannot remember of a single accident occurring, the results of which were seriously aggravated by fire communicating from Baker heaters."

Mr. A. Watson, general superintendent Duluth, South Shore & Atlantic Railway, writes:

"The cars this winter will be heated same as last and previous winters, some of them by Baker heaters, some by coal stoves in each end."

Mr. J. B. Mulliken, general manager Chicago & West Michigan Railway, writes:

"We propose to heat our passenger cars during the coming winter by means of the Baker and the Peter Smith heaters, with which they are already equipped."

Mr. E. Dickinson, general superintendent Union Pacific Railway, writes:

"In reply, I have to say that we have not yet decided on any change from Baker heaters, which, up to the present time, have given satisfaction."

Mr. H. M. Britton, general manager Rome, Watertown & Ogdensburg Railroad, writes:

"In reply to your letter of Sept. 1 will say: We will use the Baker heater greatly, and try steam heating."

Mr. Geo. L. Bradbury, general manager New York, Lake Erie & Western Railroad, writes:

"I very much fear we will not be able to apply steam heating apparatus to our coaches for this next winter."

Mr. H. A. Du Pont, President Wilmington & Northern Railroad, writes:

"We do not heat our passenger cars with common stoves, but with an improved heater inclosed in an iron case with double self-locking doors.

"Our experience leads us to believe that the method of heating is reasonably safe. Winter before last, one of our passenger cars, equipped as above stated, was in a collision on the Philadelphia, Wilmington & Baltimore Railroad, in which the heater was knocked from one end of the car to the other without setting fire to the wreck.

"We have not decided as yet to make any change in the method of heating our passenger cars during the coming winter."

Mr. H. G. Young, general manager Delaware & Hudson Canal Co., writes:

"Referring to attached letter, we have made arrangements with the Safety Car Heating & Lighting Co. to make a trial of their system of heating cars this fall. I hope to determine upon some system of heating our cars in accordance with the terms of the statute regulating the same, and which takes effect May, 1888, and propose to experiment during the time intervening with several of the most approved methods."

Mr. N. Monsarrat, general manager Cleveland, Akron & Columbus Railway, writes:

"Replying to your letter of the 5th instant on the subject of car heaters, I beg to say that my company has not adopted any changes yet for the coming winter. We interchange our passenger equipment with the Pennsylvania Company, and will be very likely to follow any new standard that may be adopted by that company."

Mr. W. P. Holman, general manager St. Louis, Arkansas & Texas Railway, writes:

"I beg to state in reply, that we propose to heat our cars with stoves this winter, being not thoroughly of the opinion that the plans for heating them otherwise have attained such perfection as would warrant us in making the change at this time."

Mr. A. A. Folsom, general superintendent Boston & Providence Railroad, writes:

"We shall use the Sewall heater and the Gold."

Mr. G. R. Brown, general superintendent Fall Brook Coal Company, writes:

"Replying to yours of September 5th, would say, we have not made any definite arrangements for the heating of our coaches this coming winter. The matter is being looked up now, and we are trying to find out what other roads are going to adopt, and if possible get the best before applying it to our cars."

Mr. H. J. Whitcomb, general manager Milwaukee, Lake Shore & Western Railroad, writes:

"Replying to yours of the 5th inst. I beg to say that we have not yet seen any thing intended to replace the car stove, which in our judgment will meet all of the conditions of our climate, etc. We are therefore still waiting the result of investigation and experiments."

Mr. John C. Gault, general manager Cincinnati, New Orleans & Texas Pacific Railway, writes:

"I beg to acknowledge receipt of your favor of the 5th inst., asking me for any remarks which may be proper with reference to the emotional movement passing over the country in regard to the heating of passenger coaches. The best heater which has heretofore been brought forward is no doubt the Baker heater. It is true that in some cases where accidents have occurred, there have been fires by the breaking open of the stove, but no one has yet been able to tell or guess how many people, under similar circumstances, would have been scalded to death by steam if the train had been provided with a heater taking steam from the locomotive. There are many roads in the United States which will never be able to rely on steam for heating their passenger coaches. Take all the roads in the Northwest where they are liable to be snowed in for ten days at a time, and the engine is left without fuel and steam, what would become of the passengers in a case like that?

"So far as we are concerned we have no idea of making any change in regard to the heating of our cars, although people are rushing into the matter and wealthy men are putting their money into companies with large capital. Still I think it a sensational movement, and not liable to make any reliable progress."

Mr. Herbert Wallis, mechanical superintendent of the Grand Trunk Railway, writes:

"I have to say that the cars of this company are warmed, as a system, by the Baker & Smith heater. We shall, no doubt, have several experimental trains of other systems taking steam from the boiler of the locomotive, but until we have demonstrated that any one of the proposed systems is better than the one now generally in use, we shall not, of course, make any change."

Mr. A. H. Swanson, general transportation manager Houston & Texas Central Railway, writes:

"Replying to yours of the 5th inst., we have made no arrangements so far to heat our passenger coaches during the winter months, except in the usual way with the Baker heater."

Mr. S. B. Haupt, superintendent of motive power of the Norfolk & Western Railroad, writes:

"We have not yet decided definitely upon what plans we propose to follow for car heating, after the removal of stoves. For this winter, we expect to continue the use of stoves and Baker heaters for car heating. The subject will receive early attention in the spring, and by the following winter we hope to be equipped with an apparatus for heating, which will do away entirely with fire in the stoves. Not having reached a decision in the matter, we are unable, therefore, to give you definite information upon the subject."

Mr. David Pottinger, chief superintendent Intercolonial Railway, writes:

"In answer to your letter, dated Sept. 5, I may say that the arrangements for heating cars on the Intercolonial have always been of the latest and most improved kind. Our sleeping cars have been heated with Baker's hot water apparatus, and our other cars with Spear's car heaters with hot air flues around the car.

"We have now arranged to heat our through express trains between Halifax and Quebec with steam this winter. Each of the principal systems, Martin's, Sewell's, Graydon's and Hurley's, will have a train fitted up complete and will be tried.

"These trains will also be lighted by electricity."

Mr. G. S. Getchell, general superintendent Buffalo, New York & Philadelphia Railroad, writes:

"We are now contemplating heating our cars by steam taken direct from the locomotive."

Mr. R. H. Soule, general manager New York, Lake Erie & Western Railroad, writes:

"We have arranged to equip two trains in local service between Buffalo and Lockport with the Martin anti-fire car heater company's system, also to equip two trains for service between New York and Buffalo in part under the system of the New York Safety Car Heater Company and in part by direct-acting steam heating pipes. We have not finally adopted any coupling, and do not feel ready to come to final conclusions on that important detail, which, if possible, ought to be as uniform all over the country as is the Westinghouse air hose coupling. Probably one of the two trains to be run between New York and Buffalo will have the Williames system of pipes and couplings, with a pump on the engine to exhaust the steam from the return pipe, as this feature will obviate any need of steam traps."

The American Brake and the St. Thomas Accident.

We have received from the American Brake Company the following circular:

ST. LOUIS, Aug. 30, 1887.

DEAR SIR: The evidence produced before the coroner's jury investigating the horrible accident at St. Thomas, Canada, on the 15th ult., whereby 14 persons lost their lives, and a large number were seriously injured, in a crossing collision between trains of a Grand Trunk Railway and the Michigan Central, show that air brakes upon the Grand Trunk train failed to work, because the crew neglected to test them before leaving Port Stanley (St. Thomas being the first stop). The verdict censured the conductor, and he is under arrest charged with manslaughter. The engineer was killed.

The engine of the Grand Trunk Railway was not provided with any driver brake, and a careful examination into all the circumstances attending the accident, shows that had the engine been equipped with an efficient driver and tender brake, which the engineer could have used when he found that the air brakes would not work, *the accident might have been averted, or least its results very materially mitigated.*

It will be said that the accident did not result from any failure of air brakes, but rather because of the air brakes were not attended to properly by the crew before starting from Port Stanley, and hence the crew, and not the air brake was to blame.

This is undoubtedly true, *but the results are the same*, and would it not have been the part of wisdom to have provided against just such contingencies? All men are liable to make mistakes at times, and should not that very liability be provided against, if possible?

We have always maintained, and still do so, that every passenger engine should be equipped with a steam driver and tender brake, just as powerful as the weight of the engine will allow, *independent of, and entirely separate from*, the apparatus for working the air brake upon the train coaches.

Whether it be used habitually, in making all stops, or held in reserve as an emergency brake, will of course be optional with the management. It can easily be arranged so that the same valve handle which operates the air valve can also operate the steam valve, so that a full movement such as required for an emergency stop will apply the steam brake. Then *so long as there is steam in the boiler* there will be one brake upon the engine which can never fail.

The frequent occurrence of so many serious accidents throughout the country during the last few months, which are attributed to the failure of the air brake, certainly demand that every possible precaution in this regard should be taken.

The equipping of passenger engines in this manner upon some some important lines *has prevented serious accidents in the past;* this we can prove to your satisfaction.

If so, we respectfully beg to submit that should you provide your passenger engines with an independent and reliable steam brake upon their driving and tender wheels, *you will have done all that can be done in that direction* to provide for the safety of your passengers, not only in the event of failure of the air brake mechanism, but also of *neglect of duty on the part of your employés.*

That the combination above referred to *is the perfection of a braking system* there can be no means of doubt.

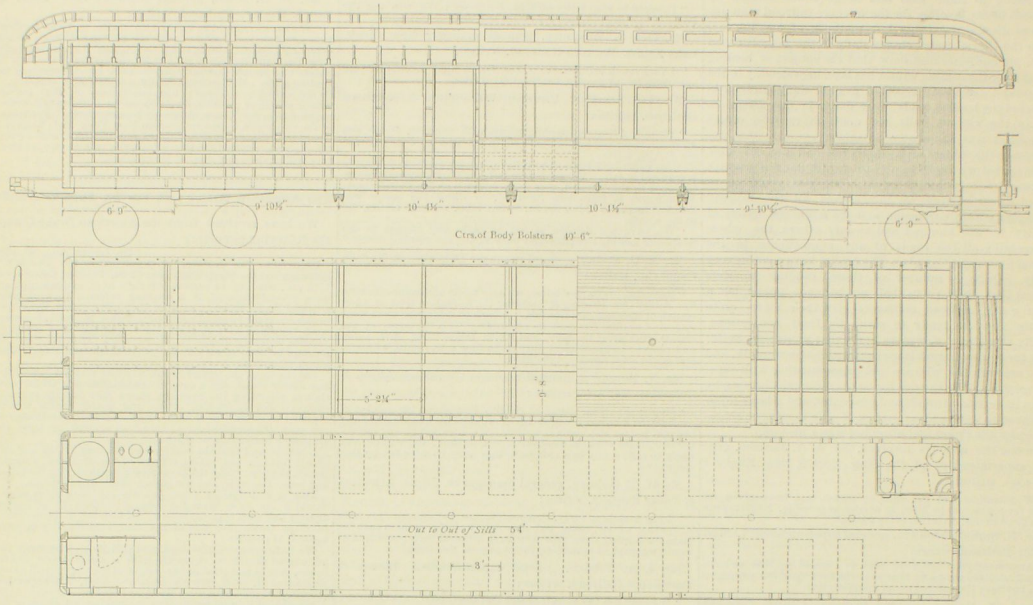
THE AMERICAN BRAKE COMPANY.

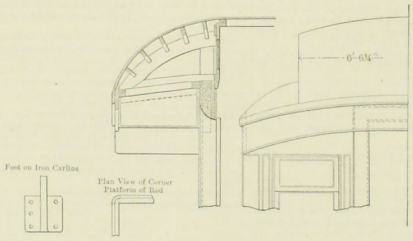
W. E. Chamberlain, former general superintendent of the Providence & Worcester Railway, is now at Bristol, Tenn., in charge of the construction of the South Atlantic & Ohio Railway, a street railway, and various other enterprises for Eastern capitalists. He is North on business.

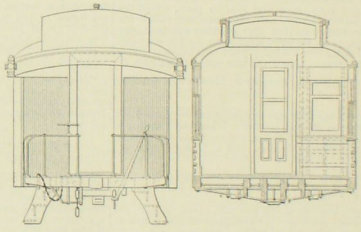
Handsome Cars for the New York & Boston Line.

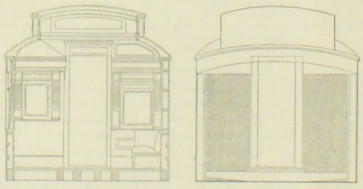
Eight months ago the Boston & Albany Railroad Company placed an order with the Wason Manufacturing Company for four drawing-room coaches, to be as elegant as possible, and with as many departures from the usual style as the Wason Company thought best to recommend. Two months were devoted to the study of designs for the interior of the cars, and now they stand completed—as perfect in arrangement and as elegant in workmanship as can be imagined. At the request of the railroad company the exterior is as nearly like the ordinary coach as possible; but the interiors, designed by Mr. Bruce Pierce, of New York City, are a revolution in the appearance of cars. The sides of the coaches are in the form of an elaborate series of bay windows, over which are the new lunette windows invented by L. C. Hyde, of the Wason Co., which add greatly to the appearance and ventilation of the cars. The *motif* of the architecture is Byzantine. The cars were finished in carved mahogany and dead bronze trimmings, the designs of which, with those of the upholsterings, plush and hangings, were especially made for this order. Gas and oil are done away with. Instead of using elaborate lamps covered with nickel plate and hung with jingling chains, counterparts of old Roman lamps and centerpieces are placed at intervals along the sides furnished with the Julien system of electric lights. The cars contain all the usual conveniences and many new ones. These are so placed, however, that they do not appear gaudy or staring. In fact, there is not a mirror nor a single piece of nickel plate in the cars outside of the lavatories. The effect is a very pleasing one of quiet, subdued elegance.—*Springfield Homestead.*

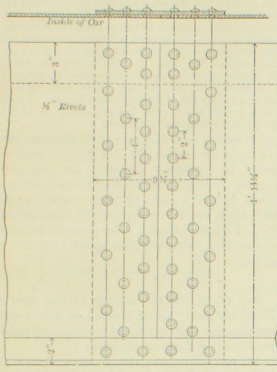
CHICAGO, BURLINGTON & QUINCY PASSENGER CAR.











Method of Riveting Joint of Chalender Truss.

The engravings represent one of the new passenger coaches now in process of construction at the shops of the C., B. & Q. road at Aurora, Ill. These cars are 54 ft. long over end sills, and each of them has a seating capacity for 54 persons. Their estimated weight is 52,000 lbs., including two four-wheel trucks, which weigh 9,000 lbs. each. The trucks have 33-in. cast iron wheels. The outside sills are 5 × 8½ in., and the intermediates 5 × 7 in., all of Norway pine. The siding is ¾-in. whitewood in narrow strips, tongued and grooved, and glued on edge. The upper deck, as will be seen, extends to the end of the main roof and terminates in a neat and graceful curve. The lower line of letter-board is carried out straight over the platform and the ends joined by sheet iron, forming a protection from sparks and rain, as well as affording a good point for attaching the tail signal lamps. The inside finish is in antique oak, with panels and moldings in modern style. The trimmings are in plain bronze, the headlinings of maroon canvas secured with large brass nails, and the upper deck glass of small panels of molded colored glass. There is a separate saloon for women, and a washstand for men and women both. A Baker heater will be used, so as to have the cars piped for the most approved system of continuous heating.

One of the cars will be fitted with Forney seats, and the alcove for arm under window. Some other coaches will be equipped with the Gilfillen chair, a good substitute for the ordinary coach seat. It occupies less room than a car chair, and is quite as comfortable, and certainly more so than the regular coach seat. The body truss is the Challender plate-iron truss, generally used on the C., B. & Q. passenger equipment.

Meeting of Western Railway Club.

The Western Railway Club held its first meeting after the summer vacation Sept. 21, at the Grand Pacific Hotel.

The meeting was organized temporarily with Mr. B. K. Verbryck in the chair and Mr. Willard A. Smith acting as secretary.

The chairman appointed Charles F. Pierce, Samuel Pullman, and A. Forsyth as a nominating committee to nominate officers for the ensuing year.

The nominating committee presented the following names: For President, G. W. Rhodes, Chicago, Burlington & Quincy; Vice-President, B. K. Verbryck, Chicago, Rock Island & Pacific; Secretary, Angus Sinclair, NATIONAL CAR AND LOCOMOTIVE BUILDER; Treasurer, W. B. Snow, Illinois Central.

The officers named were declared elected by acclamation.

CONTRACT WORK IN RAILWAY SHOPS.

The discussion on this topic was introduced by Mr. F. D. Casanavo, of the P., Ft. W. & C. R. R. Mr. Casanave said: One of the objects of whatever system that may be adopted by the management of shops is to secure a fair return for the money expended for wages. This result is attained when each workman makes the best possible use of the time he spends in the service of his employer, and the most efficient system is that which secures this result with the least friction and with cheerful acquiescence on the part of the employé. To fulfill these conditions it must be a fair and just system to both employe and employer. In the majority of railroad shops the employés are paid by the hour or day. In a few shops the contract system has been introduced as far as practicable, and the workmen are paid a price fixed in advance for each job or operation. The question at issue is, which of these two systems of remunerating labor is best adapted to bring about the fulfillment of the conditions essential to successful management. It may be readily perceived that a valuable feature of the contract system is that which directs the interest of the workman toward increased production, for his income is measured by his capacity to produce. Therefore, time being money, the workman makes the best possible use of it not only for himself but also for his employer. This valuable feature is entirely lacking in the system of day work. In this case the employer alone is interested in production. To the workman quantity of work done means nothing: his pay will be the same for a given number of hours whether he has done much or little; and quantity, therefore, depends upon his honesty or the vigilance of his foreman. Every practical man knows how difficult it is to secure perfect attendance to duty through supervision. This waste of time is an injustice which results in serious loss to the employer. It would, therefore, seem fair to conclude that that system is preferable which will best remove that evil. It is well known that the contract system accomplished this result. It can also be shown that if equitably devised and applied, it is more profitable and just to the workmen also. In shops where labor is paid by the hour or day, there are often variations in the rates of pay of workmen engaged in similar occupations, for various reasons. These reasons may seem satisfactory to the managers, but seldom are to those whose earnings are affected by them. In fact, some of these reasons can not, when calmly considered, be justly defended or supported. Two workmen may be engaged at the same kind of work. There may be no difference in their ability to do that work well and quickly; one is an old hand, the other has recently been employed or is a former apprentice out of his time. The older workman is paid the higher wages; the other may receive from 10 to 30 cents per day less. Is it to be supposed that the poorly paid workman does not know his worth as compared with the other? He obtains that knowledge very soon after he comes in contact with his companion. What effect must this difference in pay have upon his interest in his work? It will certainly not tend to quicken it. He will make up his mind to do as much as he thinks he is paid for and no more. He thinks himself slighted and injured, and will be dissatisfied until his pay is increased, or, if it is not, as long as he remains in the company's employ. There are many such cases in large and small shops, the existence of which is not beneficial to the company, financially or otherwise. Suppose the case in a different light. The older employé may not be the better workman of the two, in which case the injustice is still greater. He will have no love for the corporation which he will say "robs him of his time and money," and will make use of that expression during his leisure moments with telling effect upon other workmen who may be similarly treated, or may imagine themselves burdened with grievances. Contract work, on the contrary, admits of no variations in pay. If the employer establishes just prices, the workman is satisfied. All he asks is fair compensation for his labor. He cares not then what his neighbor's rate of pay may be. Whether that is more or less than his, the price of the job is the same for both and the earnings greater for the better man. Each tub stands on its own bottom. If he be unusually skilful or industrious, his efforts are proportionally rewarded. If, on the contrary, his brother workman is less able or willing than he, his earnings are proportionally less; yet the full compensation received by both is just and must be so recognized. Intellectual and physical differences exist and vary in different workmen, just as they are found to vary in individuals of other callings, and as success in life depends, as a rule, upon the ability and energy which every individual devotes to his particular business, it would seem but just to devise a system that would enable mechanics who possess superior ability to earn and prosper in proportion to the qualities with which they are gifted. Such result, however, can only be attained under the contract system. Another advantage of this system is its tendency to raise the standard of a workman's ability. Self-interest and pride will spur an inferior mechanic toward the improvement and development of his mechanical skill. Every successive effort will bring him nearer to his more favored or experienced neighbor. His reputation and his pocket-book are at stake. Mechanics will use their brains as well as their hands in devising appliances and tools which will shorten their work. Their interest is awakened, and like the rest of the world they work in earnest to make money. The day-work system offers no such advantages. Its tendency is, if not to entirely dwarf a workman's ambition, to at least prevent its full development; for it is clear that any special effort for the improvement of his mechanical skill and speed would result in profits which he would not in all probability share to the extent he might think himself entitled, and therefore such effort will not be made. Considered in the light of fairness, justness, policy and profit, the contract system is in our opinion by far the best for both employer and employé, and its adoption will amply repay all the labor involved in its successful introduction.

COMPARISON OF CONTRACT WORK WITH DAY WORK.

Mr. Casanave was asked if he could furnish any figures illustrating the working of the contract system. He said: I can not at this time give any comparative figures showing the difference between contract and day work. I have not the information with me, but I know that work done by contract will cost at least 33 per cent. below the figures that it will cost by day work; that is after the system is well started. When the workmen become accustomed to work under that system they do a great deal more and do it a great deal more quickly than under the other. I have with me the figures of a few men who have been doing this exact work for us. Here is one, a lathe man, paid at the rate of 25 cents per hour, and it amounts to $72.46 for the month. In addition to that he had some day work also. It is absolutely impossible in a repair shop to do all the work by piece work: some of it must be done by day work. I have here the record of the earnings of a gang of four men engaged in erecting three first-class Mogul engines. Each of them earned about $124 in the month, and in this connection I may say that we can build those engines for $8,500, and we couldn't buy them for less than $10,000. I do not believe we could build them at that price by any other system. Even our car repairs are all done by contract.

The president invited other members of the club to take part in the discussion.

Mr. Verbryck: Mr. President, I can very readily see how new work and the rebuilding of cars and engines can be done by contract work in a repair shop, but I fail to see how we can get at the ordinary repairs. For instance, I have men working at contract work, new work, we will say, and there comes in a car that needs some light repairs; I have got to take those men off their work and put them on the light repairs. I would like to ask Mr. Casanave how he works it in such a case. And just so with freight cars; my men are building or rebuilding cars, and there comes a rush of freight repairs; I have got to take the men away from their work and put them on those repairs; then they go back to their work again. Now, how do you work it?

Mr. Casanave: We have an item 201 list of the probable repairs that any car is likely to get, and if a man performs a job of repairing, we pay him the price for it. It is necessary to have a price for each operation, and our list is gotten up so that each individual case can be met. Suppose we should have to remove end sills, we would pay for that a certain price, including the removal of the old ones, and the replacing of the new ones. We can send any man from his new work to do that job, and pay him the stated amount. We specify in each case what work we consider necessary to be done to perform properly each particular job of repairs. The car is examined and men put on to perform such repairs as are considered necessary, but if when they get the car turned up they find something else that seems to them necessary to be done, they report it, and they are told whether or not to do it.

Mr. Verbryck: Does not that require a great deal of clerical work?

Mr. Casanave: It is all kept track of in one shop by one clerk.

Mr. Mackenzie, New York, Chicago & St. Louis: It seems to me that with Mr. Casanave's system it would require a very skillful inspector to watch the operations of these men. Even in the best regulated shops our foremen have enough to do to watch the work of our most skillful men. It comes natural to most men to grasp for the almighty dollar, and here they build up a system which encourages them to grasp for it. It seems to me that it would be very difficult for the foreman or inspector to get the right kind of work out of the men when changing them from one job to another. I should think that with the same pay they ought to be able to get much better work from day work than from contract work.

Mr. A. Forsyth, Chicago, Burlington & Quincy: We commenced doing piece work in the Aurora shop about three or four years ago, and our experience has been much the same as Mr. Casanave's. We can do the work 33 per cent. cheaper than by day work, and the foreman does not have so much trouble watching the men to see that they do the work well as he had formerly. A piece of work goes from one man to another and the one man becomes in a sense an inspector over the other.

Mr. Casanave: Of course the tendency is for a man to make all the money he can and as quick as he can, but we have no more time to watch them. A workman under the day-work system does not care much whether he has any work or not, but put him on piece work and he knows just where to find the foreman as soon as he runs out of a job. The foreman must provide the men work and then see that that work is well done. You must have a man who is responsible for the work of the others, and you can pay that man by the day. Another thing is that if work is not well done, and it is discovered, they have to do it over again. If a piece of work passes from one man to another, and is spoiled, we make the last man pay for it, because it was his duty to see that it came to him all right. They work to make money, and it is to their advantage to do every job right, so as to get another one.

Mr. Pullman, Chicago, Rock Island & Pacific: In our shops we put our men at what they can do best, and they have different grades of wages, some getting a great deal more than others. It seems to me that with the contract system we should have more trouble with the work.

Mr. Mackenzie: I believe that in some instances the piece-work system will increase the amount of work that can be produced in a shop. There are a great many things about cars and locomotives that can be very readily done by the piece, and perhaps for the benefit of the company. The very fact that Mr. Casanave produces figures here showing that he can make engines in his shops for $1,500 less than he can buy them for is something worth considering. And he gets this result from piece work; he couldn't do it otherwise. But I think it requires a great deal more skill to watch piece-work shops than it does to watch day-work shops.

Mr. Swanston, Pittsburgh, Cincinnati & St. Louis: I have been trying to introduce piece work, but only slightly. We have introduced it in some instances, but not yet generally. I believe that piece work is advantageous. There is no doubt you can get more work, and after you get the system in operation you can probably reduce the price. We have not yet reduced it, we are simply getting more work.

President Rhodes: Is not what Mr. Swanston said the key to this move in regard to piece work? We are endeavoring to get the greatest possible service out of our engines and cars, and is not it important to those having charge of shops also to endeavor to get the greatest possible service out of them? It seems to me that there is where the interest lies. If we have shops that more than meet our capacity, there is perhaps not so much necessity for changing the system; but it is where we do not have shops to meet our capacity that the master mechanic or master car-builder is pushed to find methods for getting more work, and he resorts to the piece-work system. When I worked in the Altoona shops, a number of years ago, and worked by the day, the question used to come up constantly as to whether piece work was a proper way to pay the men. At that time I was considerably averse to it, and thought it was not the proper way, and my reason was that I did not see how the person in charge could do justice to the men and at the same time pay for piece work. I thought that when we established a certain rate for a certain job, and found the men beginning to earn too much money, we would at once reduce. He would accept that reduction probably, and in time we would find he was making too much money, and we would reduce him again, and it seemed as though that would eventually bring about discord and dissatisfaction. That idea, however, was thoroughly cleared up in my mind. A few years afterwards, after I had left the shop, I visited Altoona, and I talked with a man that I had formerly worked with. He was turning chilled wheels, getting 50 cents for each wheel he turned, and I said, "How do you like this piece work?" "Oh, this thing suits me," he said, "I earn $5 a day. I can turn 6 wheels a day without any trouble." I said, "It seems to me that when the price of work is reduced it must cause dissatisfaction." "Why," he says, "I work all the time now. Don't you remember how we used to loaf when we worked by the day?" If men are earning, say $80 a month, and we establish a piece-work price, by which they can earn $120 or $130, they must know that they have been cheating the company before, and, there ore, they do not object to a fair rate for a fair day's work. You can average up a rate even for repairs. We introduced the system at Aurora about four years ago, and we have not been disappointed at all. We have made constant reductions in the price of the work, and increased the capacity of our tools, all without any dissatisfaction among the men.

Mr. Casanave: There are not 20 per cent. of our prices that have not been changed, and I have yet to hear the first man say that our price was not fair. We have never had a complaint from our officers that these men were getting too much pay, and we benefit the company by obtaining ten hours work from every man. Even if a man makes five dollars a day, if we think the price is fair for the labor, it is all right, and we are satisfied.

Mr. Schroyer: I am favorable to piece work, but when I come to apply it in my own individual case I see a thousand and one difficulties. As regards the value of a man to the company, I do not consider that a man is valuable simply because he can jump right on to a job and slash and cut and get it done. I consider the man valuable to the company who can go inside or outside of a coach and do the work that is to be done there. We have nothing but day work at the Northwestern shops. We have all classes of workmen and laborers, and they are all paid a different rate of pay. Piece work as applied to passenger and freight equipment we have never given any consideration to at all.

The President: Undoubtedly there are difficulties in the way of introducing the piece-work system, and that is probably the reason it is not more general.

Mr. Casanave: There would not appear to be so many difficulties if the forces in your shop were properly balanced. We found the same difficulties that Mr. Schroyer mentions, and we had to change the whole character of our shop. We had to introduce more machinery and more men.

On motion, the discussion was closed.

The second subject discussed was Car Couplers. The discussion was opened by President Rhodes, and was participated in by Messrs. Mackenzie, Ferry, Pierce, Buhoup, Verbryck, Schroyer and Casanave.

Locomotive Throttle Valves.

The throttle in general use on modern locomotives is a nearly balanced poppet valve operated by a lever. This meets all requirements in regular practice, but it does not seem to operate as it should in special cases; in this one, for instance, which occurred recently on the Pennsylvania Railroad, at Philadelphia:

A shifting engine ran into a passenger engine (with no fireman on) hard enough to knock the engineer off senseless and throw the throttle wide open. The engine at once started at full speed, and a mile beyond struck another engine (with no fireman on), knocked another engineer off senseless, and another throttle wide open. The two engines bounded up the track together at their highest speed, with every condition present for a terrible catastrophe a few miles beyond, where they were sure to meet some train. But here the luck turned. For some unexplained reason there was a short stub switch open in the main track, or both engines left the rails and took it, and after running 100 yards on it, they ran off the end of the 30-foot embankment and were badly wrecked. What might have happened had these two engines in succession struck a train, is fearful to contemplate.

Such occurrences ought to be beyond possibility, and a simple lock-up locomotive throttle could easily be made. If it could be as readily sold there would be no other kind in use, but master mechanics are conservative, and tell inventors and others that there is no need of a lock-up throttle. Accidents from self-opening throttles are of common occurrence, and should be rendered impossible.—*Mechanical Engineer.*

Report of Tests of Strong Locomotives.

The Strong Locomotive Company employed the well-known mechanical engineer, Mr. E. D. Leavitt, Jr., to make some tests of their locomotives. Mr. Leavitt sent Mr. J. S. Coon, one of his assistants, to make tests of two of the Strong locomotives on the Lehigh Valley Railroad, comparing their performance with an ordinary link motion engine belonging to the road named. The report of the tests has just been made public, with Mr. Leavitt's remarks thereon.

Taking leading particulars of the engines tested, No. 444 has cylinders 20 × 24 inches, three pairs of driving wheels 62½ inches diameter, has the Strong twin furnace boiler, giving 62 square feet of grate area and 1,848 square feet of heating surface, and the Strong valve-gear operating four valves. Engine 383 has an ordinary straight top boiler with fire-box over the frames, 37 square feet of grate area and 1,826 square feet of heating surface, has cylinders 19 × 24 inches, two pairs of driving-wheels 65⅝ inches diameter, and has the Strong valves and gear. Engine 357 has cylinders 20½ × 24 inches, two pairs of driving-wheels 66½ inches diameter and wagon-top boiler, 39 square feet of grate area, and 1,572 square feet of heating surface.

In the course of his remarks on the tests, Mr. Leavitt says: "The object of these tests was to determine the economy and general efficiency of the improvements of Mr. Strong. * * * My remarks will be confined to some general observations concerning the probable durability of the improved parts and the necessity which has called them into being.

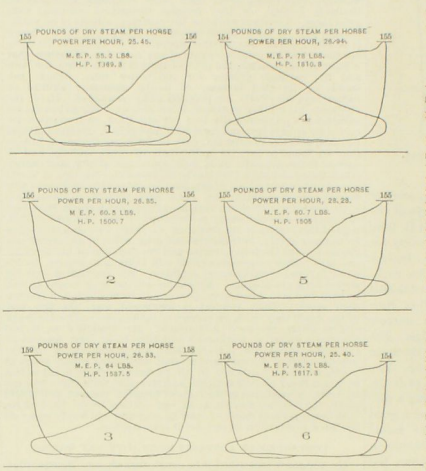
It is well known that the increased weight and speed of trains on our best lines of railway have taxed to the utmost the capacity of the heaviest locomotives in use; travelers have become used to delays of from five minutes to half an hour on short lines, and from half an hour to an hour and a half on long lines. Increasing the weight and cylinder capacity of passenger engines has failed to correct the evil of lost time, and it would seem that railway superintendents and master mechanics were at their wit's end in improving the efficiency of their first passenger service. Mr. Strong, unhampered by traditions (which are the bane of locomotive builders and master mechanics generally: of the former because the latter have them to so eminent a degree), was prepared to consider the subject dispassionately, and in this way saw the weak points of the standard locomotive. These were the boiler and the valve gear; the former was limited in grate area and heating surface, the latter gagged the steam both in entering and leaving the cylinder. To be sure the short slide valve and link motion are elegant in their simplicity, but this is all that can be said for them. It has long been known by constructors of stationary engines that four valves were necessary in an engine which should work with maximum economy and efficiency, hence the almost universal adoption the world over of the Corliss engine, and the various types which have been an outgrowth from it. In my judgment Mr. Strong's valve gear for the locomotive promises to do what Mr. Corliss has accomplished for stationary engines; it gives a good inlet and free exhaust, its mechanical details are simple, and with proper construction will be durable and free from derangement. A comparison of the indicator cards taken from engines 383 and 444 with those from No. 357 will readily convince even the most skeptical mind of the superiority of the Strong valve gear. Attention is called in this connection to the small blue print No. 143 [annexed diagrams], showing diagrams taken at a speed of 60 miles an hour, the driving wheels making 326 revolutions per minute, thus giving a piston speed of 1,304 feet per minute. The power of these cards varies from 1,369.3 to 1,810.8 horse-power, an amount which has never been equaled, and perhaps it would be proper to say, approached by any other locomotive. Although there is a falling off in the admission lines, it is no more than is always found under high piston speeds with the best forms of valve gear. In the boiler of engine 444 Mr. Strong has widely departed from previous locomotive practice at the fire-box end; he has discarded stays, and the deep fire-box for corrugated circular furnaces and combustion chambers, whereby he gets a very large grate area and heating surface of the most effective type. It will also be observed that the tube surface in the boiler of engine 444 is greater than the total heating surface of either of its competitors, and that its grate surface exceeds by nearly 60 per cent that of engine 357, which has a very large grate.

The advantages of this extra heating and grate surface are clearly shown by a comparison of the evaporation of the boilers economically considered. Referring to Mr. Coon's report: On May 11, using anthracite lump coal, engine 444 evaporated 51,422 lbs. of water with 6,948 lbs. of coal, which is equal to an evaporation of 7.4 lbs. of water to one pound of coal; May 10, locomotive No. 383 evaporated 41,734 lbs. of water with 7,217 lbs. of coal, which is equivalent to 5.78 lbs. of water per pound of coal; May 9, engine 357 evaporated 49,112 lbs. of water with 7,944 lbs. of coal, which is equivalent to an evaporation of 6.2 lbs. of water to one of coal. A further inspection shows that on the 28th of April engine No. 444 evaporated 7.91 lbs. of water per pound of coal, which was clean anthracite egg; also that on May 6 the same engine, using bituminous lump coal, evaporated 8.56 lbs. of water per pound of coal. These results show so clearly the superiority of the Strong boiler that they can not be gainsaid.

The form of the Strong boiler is one which possesses great strength combined with simplicity and accessibility; the absence of stays is a marked and valuable feature. It is well known that in marine boilers, corrugated circular furnaces and cylindrical shells have almost entirely displaced boilers with stayed furnaces and shells. With increasing pressures, the limit of which can hardly now be placed, simple, strong details are indispensable, and if the locomotive of the future is to be worked with pressure ranging from 200 to 250 lbs. per square inch, I know of no better boiler to generate and confine it than that of Mr. Strong.

Returning to the valves and valve gear. The girdiron slide valve adopted by Mr. Strong is one which has been used in my own practice for nearly thirty years, and with eminent success. No valve that has ever come under my notice is so well adapted for high pressure. None will remain so long tight and require so little attention. This is of the highest importance in an engine claiming to possess a high economy in the use of steam. These valves also are easily moved, and hence do not require balancing devices. They open rapidly with a short travel, and thus permit the use of a light valve gear. The valve gear having comparatively little work to do will not be easily deranged nor require much repair. Mr. Strong's gear appears to be eminently simple, in view of the functions which it is able to perform. It brings practically the best automatic cut-off for service on a locomotive."

In the report prepared by Mr. Coon, the construction details of the three engines are minutely given and the manner of conducting the tests described. All the locomotives were subjected to exactly the same work under similar conditions. The run was from Wilkesbarre to Mauch Chunk and return, a distance of 55 miles. On the outgoing trip the train consisted of five cars. On the return trip the train consisted of eight cars. The route is a succession of sharp curves and steep grades. The record of water used was taken by the height shown in glass tube fitted on the tender, and the coal was weighed. Records were taken from engine No. 444 during eleven trips, from engine No. 383 during four trips, and from engine No. 357 during two trips.



The most important portion of the report reads:

"If the consumption of coal of the three locomotives be compared, each on two trips when they were using the same grade of coal, to wit: Locomotive No. 444, on trips No. 4 and No. 10; locomotive No. 383, on trips No. 8 and No. 14, and locomotive No. 357, on trips No. 12 and No. 13, it gives the average for the three respectively, as follows:

	Lbs. coal
Average for engine No. 444	6,537
" " " 383	7,441
" " " 357	8,087

which is a difference of 646 lbs. between Nos. 383 and 357, or an advantage of 8.7 per cent. in favor of engine No. 383, and a difference of 1,550 lbs. between Nos. 444 and 357, or an advantage of 23.7 per cent. in favor of No. 444. It is also to be borne in mind that engine No. 357 has 2 sq. ft. more grate area and nearly 200 sq. ft. more heating surface, and much better steam room than No. 383. With equal boilers there would be still greater difference in the coal. In support of this compare the two runs of engine No. 383 on May 2 and May 10, and engine No. 357, on May 7 and May 9, as to water required from Mauch Chunk to Glen Summit, all the way up grade, and no blowing-off took place. On these four runs the load was precisely the same, about 421,600 lbs., besides engine and tender. The mean consumption of water from Mauch Chunk to Glen Summit for the two runs mentioned for the two engines was:

	Lbs.
For No. 383	17,942
" " 357	21,585

a difference of 3,643 pounds in favor of No. 383, or 20.3 per cent., which must be attributed solely to the superiority of the Strong valve gear over the best type of link motion.

The only portions of the Lehigh Valley Railroad covered by the tests, where the locomotives were brought into competition as to speed, are between Sugar Notch and Fairview, going south, where the maximum grade is 96 feet per mile, and between White Haven and Glen Summit, going north, where the maximum grade is 69 feet per mile. It is usual, on the trip north, with train No. 2, to have a helper from White Haven to Glen Summit, but none was allowed on the trips whose results are given in the tables. The running times between the stations represent the relative strength and speed of the several engines, as each was expected to make its utmost speed between these points. On other portions of the road any of the engines could much more than make running (schedule) time with the trains handled.

It is an interesting and suggestive fact that engine No. 444 made its fastest runs on these days, May 18, 19 and 20, when it drew the heaviest trains. The reason for this was well understood by all disinterested parties connected with the test.

If the two fastest runs of engines Nos. 383 and 357 between Sugar Notch and Fairview be taken, viz., May 9 and 10, there were nineteen sets of indicator diagrams taken on each of those runs between the points stated. The mean initial boiler (gauge) pressure for the 19 sets of cards is for—

Engine No. 383, May 10, mean boiler pressure	150 lbs
Engine No. 357, May 10, mean boiler pressure	151 "

If these be multiplied by the tractive force per pound of mean effective pressure on piston of the two engines, viz.:

Engine No. 383, 131.3 × 150.0	20,877
Engine No. 357, 140.1 × 151.0	22,514

With the same valve gear these products should represent the relative strength and speed of the two engines. In other words, engine No. 357 should have been 7.8 per cent. quicker than engine No. 383. But, on the contrary, engine No. 383 ran from Sugar Notch to Fairview in 22 minutes 29 seconds, and engine No. 357 was 25 minutes 0 seconds, making the same distance, with the same load, or 9.4 per cent. slower than engine No. 383. It would seem as though but one inference can be drawn from this, to wit: the marked superiority of the Strong valve gear over the link motion in getting rid of the exhaust steam. In other words, it is 9.4 per cent. plus 7.8 per cent. = 17.2 per cent. better in this particular instance.

In a supplementary report meager particulars are given of the work done by engine No. 444 pulling trains on various roads. The annexed diagrams are reported to have been taken on the Northern Pacific Railroad when the engine was pulling a train of twelve cars at a speed of sixty miles an hour, and represent blue print 143 mentioned by Mr. Leavitt. The revolutions are 322 per minute, and the piston speed 1,288 feet per minute.

Mr. W. H. Booth, writing to the *American Machinist*, on "initial stresses on bolts" makes some points well worthy of attention by railroad machinists and others. He says:

"It can not be too clearly remembered that bolts should always be tightened up to a tension somewhat greater than the greatest load which will come upon them. Take for example the bolts in a steam cylinder head. With a 20 inch cylinder there may be 10 bolts, and at 50 pounds pressure the load on each bolt will be approximately 1,600 pounds. With ¾" bolts we can not safely figure up the area at the base of the thread to more than one-third of a square inch, so that the load on each square inch of bolt area is 4,800 pounds. Now good iron will bear safely for an unlimited period a steady stress of 20,000 pounds, but it is necessary to use lower working stresses than this, on account of the severe torsional strains brought into play too frequently by the injudicious and careless use of a long wrench in the hands of ignorant machinists who too frequently imagine that a cylinder head needs to be screwed down to such an extent that the flanges are warped by the pressure of the bolts and the faced joint sprung out of truth. This is mistaken practice. The bolts should be tightened to something over the 1,600 pounds, but ought not to be one iota tighter than will just serve to prevent steam passing the facing, and the wrench should be used with moderation, and not as though meant as a test of the torsional strength of the bolts. Where bolts are employed to hold together the parts of a structure it is important that the same rules be observed, and the initial tension of the bolts must always be something in excess of the load carried. If not made so, the stretch of the bolts under the working load will cause them to slacken and a minute separation of the surfaces bolted together will take place, and there will be an oscillatory stress in the bolts which will be far more destructive than the steady stress due to initial tension."

New England Railroad Club.

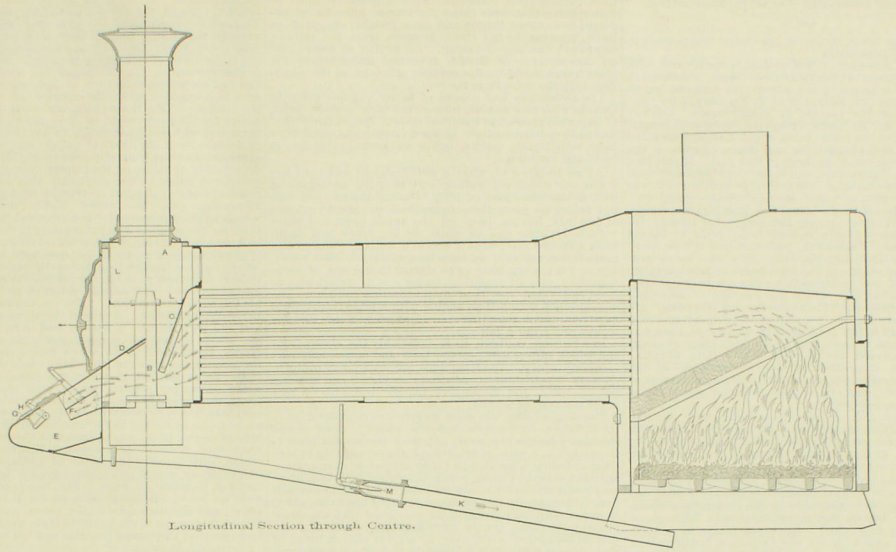
The club held its first meeting after the summer vacation at the Quincy House, Boston, on the evening of Sept. 14. The meeting took the form of a dinner, which is a new departure for this club. President J. N. Lauder presided, and among other gentlemen present were ex-Governor Smyth, of New Hampshire, President of the Concord Railroad; F. D. Adams, Boston & Albany; J. W. Marden, Fitchburg; J. A. Coleman, of Providence; Geo. H. Richards, Boston & Providence; A. A. Jackson, General Superintendent New York & New England; R. C. Blackall, Delaware & Hudson Canal Co.; J. B. Brady, of New York; Everard Holmes, General Passenger Agent Providence, Warren & Bristol; Isaac N. Marshall, Old Colony; Geo. S. Morrill, Old Colony; M. N. Forney; L. B. Bidwell, New York & New England; H. A. Phillips and J. F. Adams, Fitchburg. The attendance numbered 140, and included several ladies.

President J. N. Lauder presided. After what the president called the "solid work" of the evening was over, the meeting was entertained with a variety of interesting and amusing speeches. In the course of remarks on railroads Coleman said: "Don't let us be everlastingly harping on this matter of cheapness. Cheap materials or cheap mechanics are the most expensive things a road can have. The roads that have the best mechanics are the cheapest roads, though they cost most at first; roads that are cheapest in first cost are the most expensive. There is no such thing, with the tremendous traffic ahead of you, as doing business cheaply in the old-fashioned sense, with cheap material and inferior workmanship."

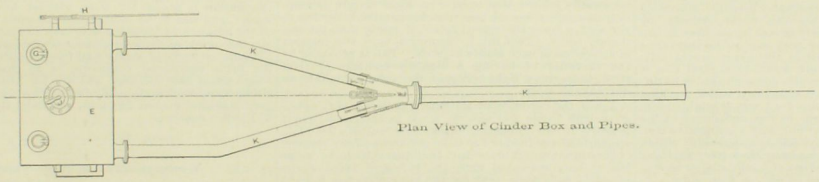
Mr. A. A. Jackson referred to the necessity of every one taking pride in his calling. Whether one is a freight brakeman or a master mechanic, he must have it, if he is going to succeed. I have never been prouder of my profession than when I have met representative railroad men anywhere. I hope this association will include in its membership all departments of the railroad business—the accounting department, the machinery department, the transportation department and the track department.

At next meeting the club will discuss "The Heating of Cars and Legislation upon that Subject."

John Ruskin, the half crazy art writer, dislikes all modern comforts and conveniences, and is particularly fierce on the subject of railroads. In a recently published letter he says: "They are to me the loathsomest forms of deviltry now extant, animated and deliberate earthquakes, destructive of all wise social habits or possible natural beauty, carriage of damned souls on the ridges of their own graves." Yet with all this tirade, which reads like a silly imitation of Carlyle's fiercest sallies, Ruskin is not crazy enough to walk when the railway train is convenient.



Longitudinal Section through Centre.



Plan View of Cinder Box and Pipes.

WILSON'S SPARK ARRESTER.

THE annexed engraving shows the details of a remarkably successful spark arresting device lately invented by Mr. William Wilson, superintendent of machinery of the Chicago, Alton & St. Louis Railroad, and applied to one of the locomotives belonging to that road. The object of the device is to arrest the sparks in the same way as the extension smoke box does, but to do the work more thoroughly. As most railroad men know, the controlling idea in applying an extension to the smoke box as a spark arrester was, that the inertia of the sparks would carry them forward beyond the line of strong draft where they would lie undisturbed until removed. In practice it is often found that the cinders accumulate so rapidly that the eddy space is filled long before there is an opportunity of emptying the smoke box, and spark throwing goes on unrestrained. The extension smoke box can not well be emptied while running, and Mr. Wilson has provided an arrangement which not only catches the sparks better than an extension front, but can also be easily emptied when running. As will be seen from an examination of the engraving, the lower part in front of an ordinary smoke box is cut out and made the opening to a spark box, which is placed between the frames in front of the smoke box. Over the front ends of the tubes a deflecting plate *C* is placed, and another deflecting plate *D* guides the cinders into the spark box, these two deflecting plates being so placed that sparks can not get to the stack without moving against the current of draft. Connected with the bottom of the spark box are two disposing pipes, one at each side, for carrying away the sparks. These pipes join under the guide yoke, and at the junction an ejector is placed, which supplies the current needed to force the sparks out of the spark box. The opening of the spark box where the cinders enter is controlled by the damper *F*, which shuts up the opening when the box has to be emptied, and enables the ejector, by the aid of the air valves *G G*, to create a violent current in the disposing pipes to force the cinders out of the spark box. In the ordinary working a small jet of steam, all that will pass through a hole ¼ inch diameter, is kept blowing through the ejector, and this is found sufficient to overcome the draft in the smoke-box, so that the force of the exhaust does not draw air through the disposing pipes. This precludes the necessity for putting a damper on the end of the pipe, and is more effective than a damper would be.

The operation of the spark arrester is as follows:

The engine is run with the damper *F* wide open and the air-valves closed. When it is desired to empty the smoke box, which is generally done going into some station, the damper *F* is closed and the air-valves *G G* opened, and the steam jet *M* is turned on full, which causes an intense draft through the disposing pipes, emptying the box in a few seconds. As the cinders which collect in a smoke-box are perfectly dead, unless where air is admitted to keep them incandescent, there is no danger of causing fire in dropping the cinders upon the track.

This is the most effectual spark arrester we have ever seen, and performs the work of preventing spark throwing in a way which we have been accustomed to think was an impossibility. There are many locomotives running with the extension smoke box, brick arch, large single nozzle, and well-arranged deflecting plate which throw very few sparks. In this respect they are a gratifying success, compared to anything ever previously in use for arresting sparks; but they all throw some sparks, and we have been accustomed to regard that as a necessary evil, unavoidable, where an intense draft, is essential, and must be maintained. The engine equipped with the Wilson spark arrester throws no sparks. The writer recently went 150 miles with the engine during a night trip, when she was pulling a fast freight train consisting of twenty-eight loaded cars. The average speed was twenty-three miles an hour; some portions of the road had ascending grades, and the engine had to be worked extremely hard to keep the train going. During forty miles of the run we sat on the top of the third car, that being the very best position on the train not only for seeing but for feeling sparks, and the remainder of the journey was spent in the cab or in the cupola of the way-car, all in points where a close watch of the smokestack could be and was kept. In ascending a heavy grade out of Joliet, the help of a pusher was needed, and the appearance of the two engines, as seen from the top of the train, formed a striking contrast. The helper was an ordinary diamond stack engine, and in working hard ejected a rainbow of fire into the night sky, as all diamond stacks do under like circumstances; but the products of the stack from the front engine, although working as hard as the other, were perfectly black. There was no more sign of fire than if the engine was not working, and the performance was the same throughout the whole journey. Working light or hard, running fast or slow, there was no spark throwing. The engine has a good large boiler that permits the use of a large nozzle while making all the steam needed, and there is a brick arch in the fire-box; but in spite of these aids to spark prevention, the engine's performance was astonishing.

A Dangerous Car.

On one page of the Council Bluffs Railroad Reporter the following item appears:

Thursday afternoon Chris. Anderson, a switchman employed in the Union Pacific freight yards at the transfer, was making a coupling when the draw-bar of one of the cars slipped from its fastenings and he was badly pinched between the two cars, receiving dangerous, if not fatal, injuries. He was taken to the hospital in Omaha, and at last advice was very low. He is twenty-two years of age and unmarried.

On another page of the same paper occurs the item:

The same two cars that caused the accident to Chrs. Anderson, an account of which will be found on the fourth page, caught another switchman, John Hildebrand, about 11 o'clock yesterday morning, while he was endeavoring to make a coupling. His injuries are principally internal and very serious. Every thing possible is being done for the sufferer, and at last accounts he was getting along finely.

Two victims to one car in one yard is coming it strong, and reflects in the most positive way against the management of the yard. The employment of coupling cars is hazardous enough at the best, and no railroad company can afford to permit careless practices that result in the mutilation of two men by a defective coupler before the car was put into the hands of repairers. Railroad companies are doing all they can to delay legislation that will compel them to adopt automatic car couplers, but accidents brought about in the reckless way indicated by the cases mentioned, undo the work of much expensive lobbying.

The twenty-fourth annual grand international convention of the Brotherhood of Locomotive Engineers will be held in the Central Music Hall, Chicago, beginning Wednesday, October 19. A very large meeting is expected, and the opening exercises will be interesting and impressive. Grand Chief Engineer P. M. Arthur and other gentlemen of national reputation will address the delegates and their friends. The local committee have made very elaborate preparations to entertain the visitors. Messrs. H. E. Wills, Wm. T. Perry and John Kelly form the committee of arrangements, and will give any desired information to intending visitors.

Englishmen Discussing Canadian Locomotives.

We continue below the most important points made in this interesting discussion.

Mr. Daniel Adamson, vice-president, remembered with great distinctness that the forged bar-frame illustrated in the paper and adopted by the Americans was the representative frame of Bury, Curtis & Kennedy, who built the engines for the London & Northwestern Railway up to about 1848, Mr. Bury being the locomotive superintendent. The bar frame being rigid laterally was certainly not so well adapted for any lateral action as the plate-frame, nor was it so cheap in first cost. It occupied more time in construction, and it interfered seriously with the width of the fire-box. Altogether, he considered it was a thing of the past, and that the Americans would do a great deal better if they adopted the English plate frame, instead of continuing to use the forged bar frame. He also remembered twelve engines being built by his old master, Timothy Hackworth, with cast-iron hollow-spoke wheels, about 1843, for Mr. John Gray, the locomotive superintendent on one of the lines south of London; they did good work, and had something like a horse-leg reversing gear or radial link, which was adapted to supersede and did supersede the old gab motion for reversing. He was not surprised at the Americans using more cast-iron for wheels, and in fact for many other purposes, than was used in England, because they had a high-class charcoal iron that answered the purpose better than ordinary English iron. One effect of such a discussion as the present he hoped would be to lead to the introduction of new compounds, whereby as good or better results could be got at much less cost.

The one-sided slide crossheads described were just like some that he remembered as a draughtsman designing about 1845–6 for a set of engines which were working on the Stockton & Darlington Railway at the time of his leaving that line in 1849.

The boiler manufacture described in the paper appeared to him decidedly objectionable, as a double-riveted lap joint was altogether unsuitable for the longitudinal seams of locomotive boilers working at the present high pressures. As long as five and twenty years ago, in connection with an explosion on the London & Northwestern Railway of a boiler with a single lapjointed seam, he had satisfied himself that the guttering of the joint arose from the departure from a true circle, though only to the extent of the lap of a ⅞-inch plate. With regard to the wagon-top, it was certainly a prudent course not to test it by hydraulic pressure according to the method pursued at his own works, namely, by putting the pressure up quickly two or three times in two or three minutes, because he was sure at the third time such a boiler as that described in the paper would fail; the disturbance of the structure would be so great that it would not be able to endure the equal strains in its different parts. Had it been a stationary boiler, working steadily under uniform pressure for hours, it might indeed endure such a change of form as was occasioned by the wagon-top and the lap joints; but with a locomotive boiler, with the pressure rising and falling considerably within two or three minutes, it was inadmissible to have anything but a true circle, either rolled out of a solid ring or having a butt joint with cover riveted on one or both sides. As the circle contained the largest area, a lap-jointed boiler was always trying to adjust itself to a true circle; and the only safe plan was, therefore, to have a perfectly true circle in the original construction of the boiler.

The steadiness of the Canadian locomotives was of course explained by their being supported on three points only: just as a three-legged stool would stand on any ground without rocking, but with four legs it was difficult to make it stand steady. With the locomotive supported on three points, when the wheels passed over any irregular ground those three points underwent less disturbance individually, and the engine therefore remained comparatively steady upon them. It might be some advantage occasionally in this country to have such engines for working branch lines with inferior roads and irregular traffic; but he thought the time had gone by when railways in general had such irregular roads as to need such an adaptation; and he hoped the time was not far distant when there would be a still smaller record than at present of breakages of rails, tires and axles. With a better selection of material, not only would the security be increased, but there might be a corresponding increase in speed. He was strongly impressed with the idea that it was to the interest of railways to get higher speed; and if they got it, whether with the American engine or with their own, so as to do more work in a given time, they would prove more remunerative than at present. In regard to the general details of the Canadian engines, no doubt the engineers who were connected with a country having such a variable temperature, such heavy gradients, and such irregular and bad roads as to be almost like paving stones for running over, must best know what was required. The engines described in the paper were evidently roughly made, and therefore did not possess any of the refinements of the fine racehorse engines taking express trains in England; but so long as the Canadian engines met the requirements of the railways in that country, by all means let them be adhered to; and if there was anything in their construction that English engineers could take advantage of, they would always be ready to do so.

Mr. Brown answers as follows: Mr. Adamson's inference that the plate frame is not rigid laterally as well as the bar frame, is rather strange to the author. Considering that the front ends in English practice are usually plated and riveted together, and bolted to cylinders, being as permanent as a girder for at least three to four feet, and that the foot plate gives the same rigidity at the back, it is utterly impossible for the frames to bend unless one or other stretches or contracts, which can not be; or else the driving horns are set bodily aside by a double "swan-necked" bend in each frame, which could not be without lossening the motion plate and cross plate in front of fire-box. The lateral flexibility of the engine frame appears to be a myth, else why is the bogie found to be such an advantage, or the radial axle-box required? Contrary to Mr. Adamson's statement that the bar-frame requires more time for construction, the author has found in both an economy in time, in first cost and in subsequent maintenance.

While on the Grand Trunk Railway from 1877 to 1883 the author repaired many engines with plate frames and found the cost of repairs and maintenance very much higher than on engines with bar frames; and on new work the plate frame was a great additional source of expenditure. This is from Canadian experience and it must be remembered that these plates (for frames) have to be imported from Great Britain and duty, freight, etc., paid on them, whereas the bar frame is made from the railway company's best selected scrap. The author is aware that on locomotives of British type and manufacture the plate frame would be the cheaper, whereas on the Canadian type the opposite is the result.

The author has had charge of many engines made in Canada with combination frames, the back portion being of imported plates and the front ends of forged bars connected by a splice in front of the driving horns, and they gave satisfactory results, but were more expensive to build and maintain.

As an instance of what a well-designed and built bar frame will stand, the author will mention an engine he built in the latter part of 1883. During the two and one-half following years this engine had an exceptional run of bad luck, having been off the track twice and badly "ditched," once due to cattle on the track and again from a broken rail; next it was in a butting collision and again it was run into an open turn-table pit. Not a bolt, key or joint in the frame was started in any one of these casualties, and all repairs to frame was to straighten one front end which was bent by the butting collision. The author much doubts if an engine with a plate frame could have borne such rough treatment at such a low cost for repairs and trifling damage.

In a butting collision it is invariably the cheap front end which suffers damage, the back and more costly part escaping injury. The front ends are easily taken down, cheaply repaired, or, if necessary, replaced and quickly put up again, the locomotive thereby being only a very short time out of service.

The speaker does not seem to give due consideration to the different circumstances under which locomotive and stationary boilers are used. As the latter are designed to be clothed in a mass of brick-work almost entirely hidden from ordinary inspection and only subject to examination at stated periods, during which time considerable damage may occur unknown to any one, and endanger numbers of lives, consequently the greatest attention has to be paid to have extraordinary strength as compared with the strain placed upon them. On the other hand the former are subject to inspection every day to a great extent, many of their defects being shown instantly to a passing observer, and few escaping the eye of the engineer. Again, they are subjected to external strains in every direction, so that if any tendency to failure occurs it is made to develop itself in the shape of leakage, and is at once detected. It necessarily follows that to have an equal margin of economy and safety in each case the locomotive boiler has to run with a lower theoretical factor of safety than the stationary boiler. That this is theoretical only, the number of explosions of each class will prove. This is produced by the necessity of having a higher percentage of rivet strength to give a tight boiler, or the result would be an unbreakable sieve.

Again, the corrosion of stationary boilers is very apt to go on both inside and outside, while in the locomotive it is nearly if not altogether inside, consequently the plate strength of the former has to be correspondingly greater.

To summarise, it is evident that the stationary boiler has to be constructed with the factor of safety as the principal end, while that for the locomotive has to have at least equal attention paid to the pressure which can be carried, *i. e.*, to getting a tight joint.

If a comparison may be instituted with the boiler built by Mr. Webb for compound locomotives and six-wheel coupled goods engines, as shown before the American Association of Master Mechanics in June, 1883, the boiler designed by the author for the S. D. Consolidation engine, being the most unfavorable for comparison, still has a somewhat greater margin of safety if constructed in a similar manner.

The author is well aware that a single riveted lap joint causes rapid corrosion due to deflection of the plate by a departure from a true circle. He is also aware that probably not more than one-third as much is liable to occur when a double riveted seam is used due to the angle which the joint takes under pressure being much less than in the former case. Further, the practice is still largely followed in England of making single riveted circular joints, and yet the author is aware of cases in which corrosion has taken place along the side of the joint round the lower part of the boiler until the plate has actually been cut through and not detected until the boiler was scaled. Thus it seems that too much attention can be paid to the form of one particular joint, while others of them are neglected. As to its being a fatal error to depart from a true circle in the construction of a boiler, it seems rather odd that the same theory does not hold good with regard to the longitudinal section which is more or less retangular. So much the worst for the theory, since the staying of the ends counteracts the inevitable destruction exactly similarly, the parts of a wagon top fire-box, or indeed any locomotive fire-box, not being a circle has to be stayed against all possible deflection, and a little examination will show that the sides of the wagon top are not only stayed to the inside fire-box, but are stayed together over the top of the inside box, so that no deflection, and consequently no destruction, can ensue.

As a fact, and as stated, no objection has ever been found in practice by testing against pressing the boilers constructed for these engines to any test pressure required up to 220 pounds any number of times, the pressure having been repeated for various purposes. The author would like to add that as regards testing boilers with water there is one very important difference between his practice in that respect and the general practice in England; that is, that instead of using cold water and a pump, he uses hot water forced by an injector, and consequently the boiler is subjected to the strains of expansion and in a condition closely approaching the actual conditions of work.

The author is much pleased with the speaker's comparison that his engines have none of the refinements of the fine racehorse engine, and would add that they partake of none of the racehorse's costly attention and care; but he has the fullest confidence that if one were put on any of the heavy passenger trains in England, it would give such an account of itself as would cause more careful comment and criticism. Let one of the English roads do as the Pennsylvania Railroad are reported to be doing by Mr. Webb's compound system, get a well designed and built modern American type of engine, and try it fully, both as to performance and maintenance.

Mr. R. Price-Williams said that, having recently visited Canada and the United States, he recognized the type of engine described in the paper as the one suited to the rough roads and the special conditions obtaining there. Through the kindness of the principal locomotive engineers in the United States, New Zealand, Victoria and New South Wales, he had been fortunate enough to have the opportunity of examining the several kinds of engines in those countries. In the case of the Baldwin engine he had had special opportunities of judging of its performance in connection with the question of cost. Through the kindness of Mr. Rotherham, the chief locomotive engineer for the government of New Zealand, he had been furnished with complete details in regard to the relative performances of the Baldwin and the English types of engines, which were generally used there. Having had the opportudity of riding on the respective engines for a great number of miles, he was able to say that in regard to economical results the rougher type of engine had a great advantage over the more highly finished engines which were more suited for the beautiful lines in England than for the rougher and lighter ones in the countries he had named. Having directed his investigations especially to the economical aspect of the question, he agreed with Mr. Greig that English locomotive engineers would do well to have more regard to the special requirements of the engines for those countries, and to forget as much as possible the requirements here. The circumstances were entirely different there. Amongst the engines in New Zealand and New South Wales he had seen some splendid specimens of English engines, such as those made by Messrs. Beyer and Peacock, which were especially designed for meeting the requirements of the roads there. Judging from the particulars given in the paper respecting the heavy passenger engines which were specially designed for working very heavy and fast trains up to ten coaches weighing 60,000 or 80,000 lbs. each, at a speed of 45 miles an hour, he had come to the conclusion that that special type of engine in no way approached the performances of a standard Midland or London & Northwestern engine, which, with the same diameter of cylinder and a little longer stroke, would pull a much greater load at the same speed of 45 miles an hour. But the Canadian engines were no doubt admirably adapted for their special purposes; and although they might not be suitable for adoption in this country, yet valuable hints might be obtained from some of the special features in their construction.

Mr. Brown answers:

Mr. Price-Williams' calculation of the respective haulage of the passenger engine described by the author *versus* a standard L. & N. W Ry. or Midland Ry. engine, seems to the author somewhat incorrect. The train specified by the author is about 312 tons, without locomotive and tender, and was to be hauled on a Canadian road, while (if the author may quote the weight of 23 coaches given by Mr. Stroudley, as hauled by the "Gladstone," which was 335 tons, *inclusive* of *engine* and *tender*), a train on one of the roads mentioned, consisting of 23 coaches, can not weigh much over 260 tons, and yet the little increase of stroke mentioned, presumably from 22 to 24 inches, should give ⅛ greater load or 340 tons, probably equal to about 30 English coaches.

Westinghouse Air Brake Tests.

Since the brake tests were made at Burlington last May, Mr. George Westinghouse, Jr., has been working to improve his apparatus so that emergency stops might be made with long trains without causing shocks in the hind cars. The brake is now in the perfected state worked out by the inventor, and a series of tests with it has just been concluded at Burlington. We take the following particulars from the *Burlington Hawkeye*:

Monday, Sept. 19, 1887, the Westinghouee Brake Company, with train of 50 empty box freight cars and a dynamometer car made a run over the whole course from Middletown, a distance of about eight miles, making four emergency stops, with the following results. Distance of stop is in fe-t:

No. of stop.	Speed.	Distance.	Grade.	Shock.
1	20½	179	Level	None.
2	28½	586	Level	None.
3	20	165	53 ft.	None.
4	40	695	53 ft.	None.

The next run was made over the same course with 20 box freight cars and the dynamometer car, which made a train about equal to the largest passenger trains, and the stops were made to illustrate the stops that may be made by this brake on passenger trains, with result as below. Distance in feet and speed in miles:

No. of Stop.	Speed.	Distance.	Grade.	Shock.
1	20	111	Level	None
2	40	421	Level	None
3	20	127	53 ft.	None
4	40	484	53 ft.	None

The grade for the third and fourth stops of this course is 53 feet down grade.

For the purpose of comparison with the above recent tests we will now give the stops made in May, 1887, under the same circumstances:

No. of Stop.	Speed.	Distance.	Grade.	Shock.
1	33	576	Level	20½
2	42½	955	Level	27½
3	28½	535	53 ft.	21¾
4	40¼	999	53 ft.	28¼

Take for comparison the fourth run of each. The stop in May required 999 feet, while that in September was made in 484 feet, showing an improvement of more than 100 per cent. The shock in May was 28¼ inches, in September, nothing.

The Brooks Locomotive Works put the spider of the piston rod on by pressure, the same as a wheel on an axle. Mr. J. H. Setchel has followed this practice for seventeen years and never found a spider to get loose on the rod. The end of the rod is riveted over as a precaution against pulling off, although that is not necessary with steam. Water in the cylinder might put pressure enough on the head to push it off were the extra strength not given.

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EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock, construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

Special Notice.—*As the* CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion, must be received not later than the 25th day of each month.*

Rights and Wrongs of Mechanical Officers.

A reform urgently needed on many railroads is the propagation among general officers of the consciousness that the head of the mechanical department is the proper man to consult regarding all mechanical matters. On the best managed roads in the country, the general manager appoints a competent man to take charge of the rolling stock and requires certain results to be obtained, but makes the officer at the head of the mechanical department responsible for carrying out all details, and no other officer is permitted to interfere with locomotives or cars. It is much to be deplored that this practice of leaving the entire management of his department to the man responsible for the work being done properly, is not more rigidly followed, and is not generally regarded as a recognized rule. Much of the friction that exists between the men in different railroad departments is caused by the practice of general officers interfering with details which they do not properly understand. There is no work connected with railroad operating so difficult to understand as the details of mechanical work, yet every official on most American roads, from the telegraph operator upward, considers himself competent to give advice on rolling-stock affairs, and is ready and willing to dictate to the head or other officers of the mechanical department about how their work should be performed. This practice has been carried to such a ridiculous extent on the worst managed of the Gould roads, that a master mechanic has not power to take an engine or car into the shop for repairs without consulting with the division superintendent. And the entire manipulation of rolling-stock and the men handling it, is done by the superintendent, one of the most objectionable features, by the by, of the Pennsylvania system of management. The consequence of this division of authority is, that there are constant conflicts, jealousies, quarreling and heartburnings among all the officers and all the men, there is *no esprit de corps* on the system, the work is carried on at heavy expense and the employés are in a chronic state of rebellion. One ruinous strike is hardly suppressed when the successors of the men turned out are ready to strike again.

In a milder degree the condition of affairs on the Chicago, Milwaukee & St. Paul Railroad are similar to those on the Gould roads. A general manager who is an amateur in railroad operating undertakes to run the details of mechanical management, and his methods keep the whole system in confusion. The locomotive department, car department, stores department, testing and other departments are all run separately, and it is hard to decide who has the right to interfere with any of the officers responsible for doing the work. With such a state of affairs, as is natural, the road has the most discontented staff of officers and employés of any railroad in the Northwest.

The roads named are an extreme cases of bad management, but on many roads managed in a much more sensible way, there is too much promiscuous interference with the mechanical department; and too great a disposition among the head officers to accept advice relating to mechanical matters from irresponsible parties. When anything is the matter with any cars or locomotive, that draws attention to them, the proper man to consult is the head of the department; but all over the country we meet with the disposition on the part of general officers to talk to a conductor or an engineer about any defect of the rolling stock, and as a result they get information often of the most unreliable character. The particulars of a curious case of interference with a mechanical matter, came lately to the writer's notice. The head of the mechanical department of an important road was experimenting with a single nozzle, and his mechanical engineer took a series of indicator diagrams, some of which were sent to the general manager's office. In the general offices was a clerk who had read up enough on steam engineering to lead himself and others into the error of believing that he knew something about steam. This clerk saw the diagrams and on some of them was the hump common to diagrams taken from engines with a single nozzle working a large volume of steam. He insisted that this was due to cylinder condensation, and poured a tale to that effect into the ears of the general manager of the terrible effects on the coal pile this defect must cause. The master mechanic was called in, and he explained that the hump was due to the steam shooting from one cylinder to the other; but the clerk, an empty headed pretentious ass, talked fluently in support of his theory, and the general manager thought there ought to be some investigation into the matter. The result was that the master mechanic had to go to the trouble of indicating the same engine with double nozzles before he proved to the satisfaction of his superior that the clerk did not know what he was talking about. There are very few matters connected with engineering harder to understand than the complex manifestations of steam, and opinions about its action are very rarely of any value except from men who have given the subject careful and enlightened study. Clerks as a rule are not consulted as experts on steam engineering, but men who know nothing more about it are habitually consulted in preference to the men whose business it is to understand the subject.

The slights and discourtesies habitually heaped upon some heads of the mechanical departments are, however, to a great extent due to want of firmness or self-assertion on the part of those who receive them. If mechanical men were habitually careful to stand out against encroachments on their duties, and displayed at all times strict attention in maintaining the dignity of their position, there would be less disposition shown to impose upon them. The man who tolerates small slights generally finds that they are the preliminary to intolerable impositions. We recently had the opportunity of noting the growth of a case that illustrates our meaning. An engineer on a road got dictating to a master mechanic about how certain work should be done, and, as the man was persistent, the master mechanic gave in a great deal to him. The thing got offensive after a time, and the master mechanic declined to be run by one of his subordinates, then the man got carrying to the general manager his views of how the mechanical department should be conducted. The master mechanic was aware of what was going on, but weakly refrained from sending the man about his business; and within the last month this engineer has made himself active in getting a petition circulated among his fellow workmen requesting the management to discharge the master mechanic!

Tests of the Strong Locomotive.

For many years a great deal of attention has been devoted in striving to produce a valve motion for locomotive engines that would be free from the well known defects of the link motion as a means of distributing steam. The problem has proved one of the most difficult ever presented in the world of engineering, for the conditions under which a locomotive is worked require that the mechanism should be fairly free from complication and durable enough to wear well under complex strains, and in the presence of considerable dirt that is calculated to shorten the life of working parts. In spite of these difficulties we have believed that a radically improved valve motion for locomotives would be perfected some day, and we have watched the labors of the various inventors with close interest, ever sanguine that their efforts in this direction would ultimately be crowned with success. For the last few years the railroad mechanical world has been kept well advised of efforts made by Mr. G. S. Strong to produce an improved type of locomotive. For several months two locomotives embodying his views have been at work, and on another page will be found the principal points made by Mr. E. D. Leavitt, Jr., on a report respecting the performance of the engines. Although Mr. Leavitt writes very enthusiastically about the performance of the engines, we confess we are disappointed at the record made and can see nothing in the performance of the locomotives to mark them as being superior to good link motion engines.

When we learned that the Strong Locomotive Company employed Mr. Leavitt to investigate the performance of their engines, we anticipated seeing a report which would give railroad men sound advice respecting the real value of the change from standard types, but a careful perusal of Mr. Leavitt's remarks leads us to the conclusion that he writes more like an interested advocate than with the tone of an unprejudiced judge. The imputation that master mechanics and locomotive builders have permitted traditions to prevent them from designing locomotives that would meet the conditions of railroad service does not agree with the facts. There is no condition of train service which the men whose business it is to design or build locomotives have failed to meet, and we are very much mistaken if there are not hundreds of locomotives in the country which can do any thing in the way of hauling trains that either of the Strong locomotives can perform, and do the work as economically.

Mr. Leavitt expresses the belief that Mr. Strong's valve gear promises to do for locomotives what the Corliss gear has accomplished for stationary engines. We acknowledge to having entertained a similar opinion till we first examined indicator diagrams from these engines, but that with the data in this report convinced us that we were mistaken, and we can not see how Mr. Leavitt can fairly make such a representation. The indicator diagrams taken during the closely recorded tests are not published, but cards taken when the engine was running at a high speed during a trip on the Northern Pacific Railroad are reproduced, and we assume they compare favorably with any thing taken from the engine since particular attention is directed to their merits. According to these diagrams, the theoretical consumption of steam averages over 26 pounds per horse-power per hour. If we add 20 per cent., which is a fair proportion, for water not shown in the diagrams, the actual steam consumption would reach a point which would be an inferior performance for an ordinary slide valve engine working with the same steam pressure. We would consider a link motion locomotive a very poor machine that did not give a better account of the steam used under the same circumstances

In the report an objection is given against the link motion to the effect that it gags the steam in leaving the cylinder. Something appears to gag the steam pretty badly as it is leaving the cylinder of the Strong engine, for the back pressure is simply enormous, ranging as it does from 15 to 20 pounds above the atmosphere, and is far greater than any thing we ever saw in a link motion locomotive cutting off at one-third stroke. The large ports and quick opening of the Strong motion ought to be a decided advantage in the admission of steam, but the prompt and wide opening given in release counts for little, as the steam meets at the exhaust nozzle a considerably smaller opening than that given by the valve. A prominent fault urged generally against the link motion is that as the link gets hooked up pre-release increases to a ruinous degree. The diagrams from the Strong engine convince us that the reputed weakness of the link motion is not so much of a fault as we supposed it to be.

To us the trips made by the two Strong locomotives in comparison with the link motion engine prove nothing, although they are treated in the report as being of the very greatest importance. We believe that nearly all master mechanics and all experts accustomed to make experiments with locomotives will agree with us that the tests, as conducted, were of no value. If the Strong Locomotive Company really believe that their engines can make a better record in train service than ordinary locomotives, they should get them put to work running the heavy fast trains on the New York Central or some other first-class railroad. If they are worthy to displace the modern type of locomotive they will soon prove their value.

How the Country's Benefactors are Rewarded.

Hundreds of the men who risked their money, dissipated their energy and spent valuable time in building up the early railroads of the country, lost all they put in, and the public alone were the gainers by receiving improved transportation facilities. In some cases where roads traversing districts that could not supply business to keep a bridle path prosperous, the railroads were poorly finished and indifferently equipped, and the persons who were enterprising enough to provide the means to build a road of any kind were cursed and abused by the very people they had been benefactors to, for not throwing more good money after bad, and providing a first class service for fourth class pay. No class of enterprising public men has been more ungratefully treated than the men who toiled to serve the public by improving the means of inland transportation. If they put all their possessions into enterprises of the kind and got nothing in return, the public has called them fools; if they have labored and risked and waited for many years and then received a good return on the investments made, their masters, the public, then call them rogues, and plainly intimate that the profits are nothing better than stealings.

The experience of Mr. Charles Crocker offers a good example of the ungrateful manner in which the men have been generally treated who helped to build up our railroad system. Before the United States Pacific Railroad Investigation Commission, Mr. Crocker testified that he had been one of the promoters of the Central Pacific Railroad ever since its inception and that he had put all the means he possessed and all that he could borrow from friends into pushing the building of the road before the government granted aid to the enterprise. In the course of his testimony Mr. Crocker said: "I was wholly wrapped up in the construction of the road, and was willing to do any thing to carry it on. I took great risk in the work. I went on

with it till I sunk all the money I had and all I could borrow. Then we got into financial difficulties, and then the time came when I should have been glad to take a clean shirt and quit. It was so long ago that I can not well remember the terms of the different contracts under which I worked. I built fifty miles of the road before the mountain part of the road was finished, and hauled locomotives, cars, and supplies overland on sleighs and logs. The road through the gap in the mountains was finished in the spring of 1868. The Finance Company was organized to unite the capital and debts of the larger stockholders of the company, and thus retain the control of the road. At the time we were deeply in debt, and it looked as though I should go to the wall. I was a rich man when I went into it, but there was one time when I would have taken a clean shirt for my interest. When the road was finished, every body was rejoiced, and the people who were glad that they had a road didn't care a continental whether I owed a million or ten millions."

To show how difficult and at how great expense the road was built, Mr. Crocker said that from Reno to the Truckee Cañon, 501 miles, the road was constructed in nine months and twenty days. Two hundred miles from the cañon laborers were sent forward to have the road prepared so that when the track reached the Humbolt River the work could be pushed forward. Water and provision had to be drawn eighty-four miles for the men. The country furnished nothing but rock, and every thing else had to be forwarded hundreds of miles. All of this was done for the sake of speed. There was a great deal of extra work paid for, like the shoveling out of snow. They had to shovel snow out of a ravine nearly seventy feet deep.

"Gov. Stanford and I," Mr. Crocker continued, "were sued shortly after this to recover moneys claimed to have been unjustly obtained by us. There have been a great many of that kind of suits brought against us. Every nasty little politician and newspaper was hounding us, but we had received no moneys unlawfully or unjustly, and the suits did not prove it. We settled the suits because Huntington and Stanford thought this better than to get into a long litigation. I thought it a mistake to settle, and think so still. I wanted to fight."

Mr. Crocker said that an inquiry into those blackmailing suits was unworthy of the Commission. He said they settled simply to avoid scandal and the consequent depreciation of the securities. He declared that every little politician was attacking the road, to make popular capital and sometimes more substantial capital. "I became broken in health," he said, "and, under the advice of my physician, who told me that I would be afflicted with softening of the brain like my brother if I continued to work, I went to Europe, before going selling all my interest in the road to Stanford and Huntington at twelve cents on the dollar, nothing being paid down. When I came back in 1873 the Jay Cooke flurry was on, and they could not pay me, and we agreed to destroy the contract and I was taken in again. The sale was a bona fide one, and I considered that I had not a dollar's worth of interest in the road.

"I was a rich man when I went into this railroad business. I was not a millionaire, but money is not everything. I had a good business and peace of mind before I got into this turmoil, investigations and other mean and annoying things."

S. R. Callaway, late General Manager of the Union Pacific Railway, was elected to the Presidency of the Toledo, St. Louis & Kansas City Railroad, President J. M. Quigley resigning. Mr. Quigley's resignation was accepted by his brother directors only at his own urgent request. Mr. Callaway, his successor, is his close personal friend, and it was to gain for the company the valuable services of the Union Pacific veteran that Mr. Quigley insisted on vacating the presidency. Mr. Quigley is one of the largest security owners of the Toledo, St. Louis & Kansas City Road. He took hold of it nearly six years ago, when it was in sad shape. He became a leader of security holders whose rights were endangered, and made a fight that finally has enabled him to establish a united road, changed in half its length to standard gauge, and a half mile more being broadened daily, and, best of all, a road that is paying. All of the old disputes are settled, all the old snarls are untangled, and Mr. Quigley has been glad to find in his friend Callaway a practical railroad man who can give the road the management it requires. Mr. Callaway was in the railroad service for 21 years before he became vice-president and general manager of the Union Pacific. He has had a wide experience, among the lines with which he has been identified being the Grand Trunk, the Detroit and Milwaukee, the Detroit and Bay City, the Chicago and Western Indiana, the Detroit, Grand Haven and Milwaukee, and the Detroit and South Lyons. He has an intimate acquaintance with every Western interest, and is noted among railway managers as a "hustler." An aggressive railroad striking out for new business is exceedingly fortunate in securing such a man for its chief executive officer. The Toledo road shows already an increase of over 70 per cent. in its traffic over last year's figures. Under President Callaway there will be no halting in this progress.

Protect the Check Valve Opening.

Some of the most distressing results that ever attended railroad accidents have been due to the check valve being knocked off the locomotive in hind end or side collisions, letting the steam and hot water pour out of the boiler and scald people to death. The desirability of removing this source of danger or of doing something to lessen it has been repeatedly discussed at master mechanics' conventions, and nearly all are of one accord in admitting that the present practice is dangerous and ought to be changed; but the sentiments of the convention meetings appear to exert very little influence on the subsequent action of the members, for scarcely any roads have effected improvements that would make the check valve no longer a source of danger. Really the best and most radical cure for this danger would be the carrying out of means to prevent collisions, but unfortunately there is little prospect of the needed changes in operating being carried out soon that will materially lessen train accidents, and therefore the next best thing to do is to make the inevitable accidents as harmless as possible.

The ordinary check valve case is a very weak article of brass or cast iron which gets knocked off with a light blow. It would be an easy matter to put a shield over the check valve case which would be as strong as the boiler to withstand a blow, but the simplest and safest plan would be to place a valve inside the boiler that would be self-closing. The Pennsylvania Railroad Company a short time ago applied this safeguard and improvement to many of their locomotives, and already they have been well repaid for the outlay. An accident happened at Havre de Grace lately where a locomotive ran into the side of a passenger train. The check valve was knocked off, but there was a valve inside which kept the steam and water from escaping. A small hole was made in the boiler by the running-board brace being torn off, and one person was fatally scalded by the escaping steam; but had the check valve opening not been protected, the likelihood is that all the people in the car would have lost their lives.

Master Mechanics' Circulars.

We direct the attention of the members of the American Railway Master Mechanics' Association and of all interested in the preparation of good reports on the very subjects under investigation to the circular of inquiry published in another column, calling for information about "Springs and Equalizers." Messrs. John Mackenzie, William Swanston, and J. S. Porter, the committee appointed to investigate the subject named, have done themselves credit in getting out the circular in great good season, and in preparing a series of questions that are calculated to elicit all the information available on the subject. The members of the committee having done their duty, the next thing is for the members to respond like men with the good of the Association and the interest of railway machinery at heart, and send in replies which will form the basis of a valuable report. Answering the circulars of inquiry is not necessarily confined to members of the Master Mechanics' Association. It has always been customary to send circulars to all leading master mechanics on the American continent and in English-speaking countries, and some of our British friends have always been noted for sending all the information they could. This practice might be imitated with advantage by the master mechanics in America who are not members of the Association. They are cordially invited to answer the circulars and the members of the Association are entreated to do their duty. The success and prosperity of the organization depends upon the support given by the members and supplying information for the various reports is helping an important element.

Steam Brakes as Auxiliary to Air Brakes.

The letter from Mr. John B. Gray, in another column, calls attention to a means of providing braking power for trains where the air brake has got out of order, which ought to receive the attention of all railroad men interested in the safe and punctual movement of trains.

We hold that the automatic air brake does not fail without warning to ordinarily careful men, but we admit that it sometimes gets out of order, even in the most skillful hands, so that trains have to be stopped during part of a trip by hand brakes; and we agree with our correspondence that a power brake which would handle the train in a case of this kind would be a great convenience and source of safety.

We understand that the Boston & Albany Railroad Company use steam brakes as an auxiliary to the air on all their passenger trains and that the practice gives the greatest satisfaction. We have heard the objection urged to a steam brake as an auxiliary to air, that being an emergency brake, it would not be in order when wanted; but we would not be in favor of making it an emergency resort. The right plan would be to apply steam to the drivers and tender and use it regularly in making all stops. In this way it would be kept so that it could be depended on and we can perceive no valid objection to an arrangement of the kind. Any practical thing calculated to increase the safety of train operating is certainly worthy of application.

Relative Performance of the Westinghouse & Carpenter Brakes.

An impression has been received among many railroad men and others, that in the brake trials at Burlington last May, the Carpenter brake acted better than the Westinghouse brake in service where both brakes were worked under similar conditions. This is a decided mistake. When both brakes were applied by electricity the Westinghouse made rather the better stops of the two, and in no case was there failure to work the electrical appliances that applied the Westinghouse brake, whereas with the Carpenter there were one or two failures. The Westinghouse electrical attachment is also much simpler than that used with the Carpenter brake, and would be much preferable if electricity as a means of controlling brakes were desirable, which it is not. The impression that the Westinghouse brake did not act so well as the Carpenter brake evidently arose from the talk about the hard bumps experienced with the Westinghouse brake when emergency stops were made without the use of electricity. There was no opportunity of judging what the Carpenter brake would have done in stopping a fifty car train as suddenly as possible without the aid of electricity, for the simple reason that the brake could not be worked in that way. Its method of action was electricity or nothing, and even in its own specialty it was eclipsed by the Westinghouse.

Railroad Clubs.

The reports of the first meeting of the season of the two leading railroad clubs published in another page show that the prospect of valuable work being done at the coming meetings is excellent. The New England Railroad Club opened with a social gathering, where the tone was strongly in favor of bringing the railroad officers of the various departments into closer relations by means of these clubs. The Western Railway Club opened with a business meeting, at which there were valuable discussions on "Contract Work in Railroad Shops" and on "Car Couplers." They also elected officers for the season, Mr. G. W. Rhodes being made President, and Mr. B. K. Verbryck, Vice-President, both of them new officers, both being a thoroughly good choice. The old incumbents, Mr. W. B. Snow, Treasurer, and Mr. Angus Sinclair, Secretary, are retained.

The suggestion made at the meeting of the New England Club, that the business of these clubs should embrace all departments of railroad work, would, if adopted, strengthen all the clubs already in existence, and supply membership for clubs at places where none have yet been established. If officers connected with all departments were in the habit of meeting periodically to discuss subjects of mutual interest, many details of business which frequently conflict might easily be made to harmonize.

Mr. Frank F. Hemenway has been promoted to the position of editor and mechanical engineer of the *American Machinist*, with Messrs. J. G. A. Meyer and Fred. J. Miller as associates. Mr. Hemenway has been mechanical engineer on the journal named for eight years, and since Mr. Jackson Bailey was taken sick has performed nearly all the editorial duties. Before entering the field of journalism Mr. Hemenway occupied several important positions in the mechanical engineering world. He is deservedly regarded as one of the most accomplished steam engineers in America, and his well-known work on the "Steam Engine Indicator" is the best modern authority on matters relating to steam. He is a lucid, thoughtful writer, who never fails to throw new light upon any subject he treats. The editorial columns of the *American Machinist* will be controlled by a strong, firm, judicious mind, and the proprietors of the paper are to be congratulated on the selection they have made.

On the East Tennessee, Virginia & Georgia Railway there are four master mechanics who served their time as machinists at Renovo, Pa., under Mr. W. H. Thomas, who is now superintendent of motive power of the road named. There was a particularly bright class of young men at Renovo at that time, and a spirit of acquiring knowledge relating to all departments of their business was zealously ripe among them. They are now scattered all over the American continent as master mechanics, several of them occupying higher positions. Probably no shop in the country has turned out so many young men who have advanced quickly to responsible positions.

Poor's Manual for 1887.

The twentieth volume of this manual has been received. There are the usual tables giving the mileage, capitalization, funded debt, etc., to December, 1887, for all railroads in the United States, Canada and Mexico. According to the Manual, the traffic operations for the year—the passenger and freight movement—were largely in excess of any previous year, but the increase in the volume of traffic was nevertheless little above the average increase of past years, and is indicative of a healthy revival in the business of the country, and a continuance of its development rather than of any extraordinary movement due to speculative causes. In both passenger and freight traffic the rates per ton per mile and the average carrying distance of each

fell off a trifle, so that, were it not for the increased movement of persons and merchandise, the earnings would have shown a decrease. The gradual reduction of freight and passenger rates is, however, a natural sequence to the growth of the country. During the past year this decrease was less noticeable than formerly; for the reason that rates are now so low in the average as to admit of but very little further decrease. The earnings of the year, when compared on a mileage basis with the average of 1885, show large increases, but yet fall very short of the averages of 1884 and 1883. This may be accounted for in some measure by the fact that a large extent of the mileage constructed in recent years has been through long stretches of comparatively undeveloped country; and again, by the fact of the construction of duplicate unparallel lines. The exhibit of earnings is made still more gratifying by the reduction in the cost of operating the roads, the total cost in 1886 being 63 84 per cent. of gross earnings, against 65.12 per cent. in 1885, the reduction being due chiefly to improved methods and the introduction of necessary economics.

Among the additions to this year's Manual is a copy of the Inter-State Commerce law, which was passed by Congress last winter. There are also tables giving the range of prices of stocks and bonds at the principal exchanges in this country.

The following summary shows the comparative results of operation in 1885, 1886, the quantity of rolling stock, etc.

	1886.	1885.
Total line mileage	133,000	128,000
Mileage constructed within the year	9,000	3,131
Total track mileage	168,047	160,597
Gross receipts for passengers	211,929,857	200,883,911
" " " freights	550,359,054	519,890,992
" " from other sources	59,003,038	44,735,616
Total gross receipts	$822,191,949	$765,310,519
Net earnings	279,311,615	260,488,993
Passengers carried (not including N. Y. Elevated)	382,284,972	351,427,088
Passengers carried one mile (not including N. Y. Elevated)	9,659,698,254	9,131,673,056
Tons of freight transported	482,245,254	437,040,660
Tons of freight transported one mile	52,802,070,529	40,151,894,469
	United States.	Canada.
Locomotives	26,047	1,524
Passenger cars	19,252	1,252
Baggage, mail, etc., cars	6,325	403
Freight cars	845,914	38,313

COMPARATIVE STATEMENT showing the averages per mile of stock, bonds, cost and earnings, percentage of expenses to earnings, earnings per passenger train mile and per freight train mile per passenger mile and per tonnage mile, etc., for 1885 and 1886:

	1886.	1885.
	$	$
Capital stock per mile of completed road	29,035	29,807
Bonded debt per mile of completed road	29,062	29,453
"Cost of road and equipment" per mile of completed road	54,301	55,059
Passenger earnings per mile of road in operation	1,693	1,612
Freight earnings per mile of road in operation	4,397	4,219
Gross earnings per mile of road in operation	6,570	6,765
Net traffic earnings per mile of of road in operation	2,376	2,185
Percentage of expenses to earnings	63.84	65.12
	$	$
Passenger earnings per passenger train mile	1.006	0.949
Freight earnings per freight train mile	1.573	1.518
Gross earnings per revenue train mile	1.443	1.366
Gross expenses per revenue train mile	0.921	0.892
Net earnings per revenue train mile	0.522	0.474
	Per cent.	Per cent.
Passenger earnings—proportion of gross	25.77	26.9
Freight earnings—proportion of gross	66.94	67.4
Other earnings—proportion of gross	7.29	5.7
	Cents.	Cents.
Earnings per passenger per mile	2.181	2.198
Earnings per ton per mile	1.042	1.057
	Miles.	Miles.
Average distance per passenger	25.27	25.99
Average haul per ton	109.49	112.46
	Per cent.	Per cent.
Interest per cent. of bonds	4.75	4.77
Interest per cent. of bonds and debt	4.53	4.62
Dividends per cent. of stock	2.02	2.02
Interest and dividends per cent. of stock, bonds and debt	3.36	3.26

The opening argument which Mr. F. D. Casanave used in introducing the subject of contract work in repair shops at last month's meeting of the Western Railway Club was the ablest presentation of the subject that ever has been made. We publish the address in full and commend all master mechanics and master car-builders who are interested in reducing expenses, while doing justice to industrious and skillful workmen, to read carefully the whole discussion. The tendency of the time is toward paying for results. The contract system is making quiet but rapid progress into favor, and wherever it has been tried by capable men it has been found to be a decided success. Workmen generally oppose the introduction of the system at first, but when they get fairly into it very few men desire to return to the day pay method. Contract work tends to weed out the lazy men and inferior workmen; but real mechanics and men willing to do a fair day's work thrive on it. On the day system, the worthless man is paid at the expense of industrious and skillful mechanics, and no one is more directly interested in changing that than good workmen themselves.

Mr. W. H. Booth, who has been for years a well-known writer on mechanical subjects for British scientific journals and who was for some time editor of the *Mechanical World*, of Manchester, has recently come to America to stay, and has accepted a position in the drawing office of the Strong Locomotive Company. Mr. Booth has been well trained in locomotive engineering, and his experience with railroad machinery has been extensive in England and in Australia. We have no doubt but Mr. Booth will carve out a successful career for himself on the American continent.

Mr. Frank C. Smith, for some time associate editor of the NATIONAL CAR-BUILDER, and later agent for Shoenberger & Co., Pittsburgh, has been appointed master mechanic and master car-builder of the Peoria, Decatur & Evansville Railroad, with headquarters at Mattoon, Ill.

Eighteenth Annual Convention of the Master Car and Locomotive Painters' Association.

The Master Car and Locomotive Painters held their eighteenth annual convention at the Grand Central Hotel in New York on Wednesday, Thursday and Friday, Sept. 14, 15 and 16. A grand reception was given them by the Master House Painters and Decorators' Association of the City of New York, at their rooms on Washington square, on Wednesday evening the 14th. A fine collation was served, and speeches and a general good time was entered into.

The officers elected for the ensuing year were:

President—Sam'l Brown, Old Colony Railroad, Boston, Mass.

1st Vice-President—M. W. Stines, Barney & Smith Mfg. Co., Dayton, Ohio.

2d Vice-President—J. J. Murphy, Louisville & Nashville, Louisville, Ky.

Sec'y and Treas.—Robt. McKeon, New York, Penna. & Ohio, Kent, Ohio.

The attendance of the session was good, there being 46 active members present, 15 of which joined at this meeting.

The subjects presented were of general interest, and the papers read on the several questions by the committees were able and called forth long discussion. The most practical paper read was from Alex. Campbell, of the Manhattan Elevated road, showing a series of tests which proved the drying qualities of paints mixed with four different japans in the market; and also the proportion of oil and japan which gave the best results. The papers will be published in full in the report of the proceeding.

A pleasant feature of the session was a visit to General Grant's tomb and a steamboat excursion to Manhattan Beach.

The session adjourned at 3 P. M. Friday, to meet in Cleveland, Ohio, the second Wednesday in September, 1888.

Round House Repairs and Round House Foremen.

For some years I have watched with a great deal of interest and concern the different methods of doing the running repairs on locomotives, the kind of work needed and the kind done, observed the kind of men in charge and imagined the kind of man I should prefer. I am thoroughly satisfied that great damage is done to locomotives while undergoing slight repairs in the round house. Certainly a set of side rods had better stay up than be taken down and filed by a blunderer who takes off lots of brass and puts them up badly and fails to secure a good fit in the strap, fitting so that it will be impossible to properly key the brasses up brass-and-brass without springing them; yet this is done very often.

The lining of crossheads is another much neglected piece of routine round house work; on engines having the four bar guide and long connecting rods this is not noticed, but on heavy consolidation engines using beam guides and a very short main rod it is a tri-weekly job, and many round house mechanics there be who never seem to think that the middle of that guide wears the most. The ends only receive the wear and tear of a small part of the gib, while the center is rubbed by its in entire length, and the center is called on to take the strain when the work is thrown on it by the angularity of the rod. To line up this class of crosshead properly the back end of the rod should be taken down and the cross head pinched over the guide to see that it is all right. Then the round house man should be careful to take the striking points and see that the piston travels in its proper place. Putting the liners back where he got them is like a manufacturer putting his own name on another man's work supposing it is all right. The last man who lined up the crossheads on my engine forgot to punch holes in the tin liners under the oil cups.

Calking flues that only simmer a little and do not actually blow is—in my estimation—bad practice, as the more flues are pounded or rolled the thinner and weaker they get, and as half of this kind of leak is caused by sudden cooling they will generally take up again with a hot fire. These and the thousand other little jobs that must be done should be done carefully, as to detail, and supervised by a man who knows what should be done and how to do it—a hybrid cross between an engineer and machinist, a man who has had experience both in the shop and on the road. Let's take a look at him. He should not be made of pride, arrogance and ignorance, and should be a pleasant man who enjoys the confidence and respect of the engineers and firemen, and the machinists and wipers under him. He should not be the man who refuses necessary supplies to engineers simply to show his authority and appear economical, but should see to it that every engine is supplied with all tools, etc., and kept so. Where engines run, first in, first out, and he has the marking out to do, he should be noted for his fairness and ability to sit down on schemers, and live up to any agreement the engineers may have with the company. He needs to be mechanic enough not to put a machinist to packing driving-box collars while a helper is filing brasses. He should know the annoyance, delays and danger of running engines in need of certain repairs, what must be done, and what can be left undone, if such there be. He should recognize the fact that a fireman is a man, as well as the other fellow, have no pets, but lots of friends, and a few real live enemies. I never knew a man who had no enemies to make much of a success but as a successful failure. Now, if he is this kind of a man, he knows that it is not important that he merely get the engines wiped and the work off the book, but that every machine is ready to pull a full train safely, and with some degree of comfort to her crew. That is what they are built for. It should be as much his concern that the engines steam well and do not run hot, as the engineers' who run them; and if under his care engines stay out of the back shop longer than usual he should receive some of the credit, as he deserves it.

A few years ago I enjoyed the proud distinction of being night round house foreman *pro tem.*, while a youthful machinist was East to get married, and honeymoon around, till the worst of the winter was over. We were located over 10,000 feet above the sea, in the great Rocky Mountain range; we had a small wooden round house, and no machinery; we had seventeen consolidation engines doing extra heavy mountain work, and all the snow you could wish for. These engines ran all day and laid up at night. They used the purest water on earth and were not washed out from the time they came from the back shop till they went back, yet they very seldom leaked. We had flue expanders, etc., but no regular boilermaker. The fires were never drawn unless we had repairs to make that would require the blowing off of steam pressure. We had two machinists, three helpers, and a thing (that was me). When one of these engines had worried four or five cars up a dozen miles or so of mountain grade, over 200 feet to the mile, she backed down the mountain side for more cars and was held by the water brake, and this usage was hard on the machinery everywhere and few were the nights when there were not reports on most of the engines for work to be done that let us inside the boiler shell; water-brake cocks, three-way cocks, gauge cocks, injectors, throttles, checks, etc., were leaking and must be ground in. Now, as we could use but five stalls of our house, it kept all hands rushing to get them in, steam off, repairs done, and steam on, and out again, and the last few to come in did not always get there. Now, we had a good storehouse full of all these fittings, and we soon fell into the habit of putting in new cocks for leaky ones, new air pumps on in place of those played out, and new injectors for those that failed to work; the same with checks, etc. In this way the engines were soon out, and early in the night we had everything ready for the road, and the cocks, pumps, injectors, etc., to grind in, clean up, and put in stock at our leisure, and it then occurred to me that this plan on a more extensive scale would be no bad scheme in general use. It would allow one great shop to build all the work, and the small places to put it up.

Why not have a standard for all sizes of cocks, pins and bushings, and work to a greater extent on the replacing, and not the repairing principle? It certainly would be a saving to roads short of power. Stacks, sand-boxes, headlights, ash-pans, rod brasses, pistons (except rings), all brass fittings, link gear, etc., can be done this way, and the necessary repairing work done in dull hours. This plan could be carefully elaborated so as to turn each pin and bushing just so many times, and so much, before it went to the scrap heap. But what might be a good scheme here might not be some place else, and perhaps I am like the man who would revolutionize the world to suit the whims of his own household.—*John A. Hill, in American Machinist.*

We have been shown samples of high pressure steam boiler tubes of German manufacture, which for smoothness of finish surpass any thing we have heretofore seen in that line. As these are ordinarily tested to 450 lbs. pressure, and will flange out to the thickness of a table-knife blade without any appearance of cracking or splitting, and can be crushed endways to a compact mass, without any show of the lap-weld splitting, the question of quality cannot be doubted. Messrs. Philip S. Justice & Co., Philadelphia, are the representatives of the makers of these tubes, and will furnish samples to those who may desire.

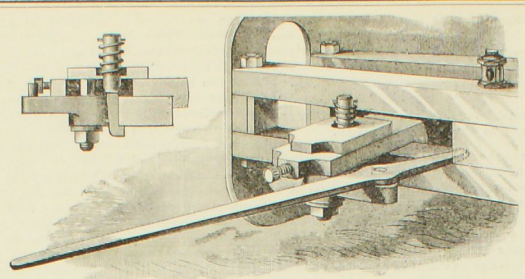
Judge Colt, of the United States Circuit Court, District of Massachusetts, decided Sept. 9 in the case brought by the Seibert Cylinder Oil Cup Company against Lunkenheimer, on the Gates patent, that the patent was valid.

The Gates patent is for the method of lubricating the cylinders and interior working parts of steam engines, showing the drop of oil passing up through water or other liquids inclosed by a transparent chamber, being that form of sight-feed lubricator known as the "upfeed."

This decision is of great importance, as it covers a very large part of all sight-feed lubricators now made and sold, and will be regarded with interest by all manufacturers of those articles, as well as railroads and other users.

The Erie Car Works, Limited, Erie, Pa., are very busy, having recently received a number of orders for cars, among them 150 tank cars for the Union Tank Line, and 250 Wickes' patent refrigerator cars.

The Consolidated Car Coupling Co., of New York, have removed their office from 71 Broadway to 173 Broadway.



McINTOSH CROSS-HEAD MOVER.

The annexed engraving illustrates a very useful time-saving round-house tool. All round-house men know the trouble and annoyance of moving a cross-head with an ordinary bar, and all interested will readily perceive the advantage and convenience of the device illustrated. Those who have used it say that the pusher is everything that could be desired for the purpose. The cut shows the device so clearly that no description is necessary. The pusher was invented and patented by William McIntosh, Master Mechanic at Winona, Minn., from whom shop rights may be obtained on reasonable terms.

The Page Belting Co., of Concord, N. H., are very busy with orders. They manufacture staple goods in both lace and belting leather, which has already attained an excellent reputation, and secured for the company a large trade. Their specialties in these goods are becoming widely known, and a rapidly growing trade is the result. Among these specialties is the new lacing called the "Hercules," made by a new principle after many years of experiment and study on the part of the Page Belting Co. Their trade extends all over the world. Among the shipments recently made is the belting and lace leather for the new works of the Northern Pacific Terminal Co. of Portland, Ore.

The firm of Merchant & Co., of Philadelphia, will, in a few months, take possession of an immense warehouse and office building which is now erecting at 517 Arch street, near its present headquarters. In 1882 a store was established in New York. It is now at 9 Burling slip. In January, 1886, a store was opened in Chicago at 202 Lake street. The agencies of Merchant & Co. for the sale of the brands of guaranteed roofing plates above named are with leading houses in cities other than those mentioned. Soon after starting in business Mr. Merchant became the agent of the New Bedford Copper Company. By 1871 or 1872, he had established an extensive trade in this metal. In 1876 he began the importation of tin plates. In time he perfected arrangements with manufacturers of tin plates in Wales which gave his house a commanding position in this trade. He secured by these arrangements the handling of the entire product of the "Gilbertson's old method" and "Camaret" brands of guaranteed roofing plates, not in this country only, but in Great Britain and throughout the world. Every guaranteed plate of these brands used in any country comes through the house of Merchant & Co.

Second-Hand Wood-Working Machinery.—One 24-inch Whitney scraper, with grinder; one 24-inch double drum "Boss" sander; one 30 inch double-drum "boss" sander; one 24-inch double drum Fay sander; one 24-inch Fay & Co. pony planer; one 24-inch Feeney, Pennington & Co. pony planer; one 6-inch single-head sticker; one 3-spindle multiple boring machine. These machines were taken in trade by us, and are in good order. They will be sold very low, to close them out at once. For prices and full particulars address The Egan Company, 235 to 255 West Front street, Cincinnati, O., U. S. A.

As will be noticed from a perusal of the letters from leading railroad men on another page on car heating, the Spear safety stove has, like other safe methods of heating, received a rapid impetus into popularity. The inventor of the Spear stove has been working on car heating and ventilating for thirty years, and he considers his system is now as nearly perfect as it can be made. A highly satisfactory feature about the Spear heating system is that the stoves are made so strong that there is no danger of their getting broken up in a wreck, and the openings are effectually secured so that they will remain shut in case of accident.

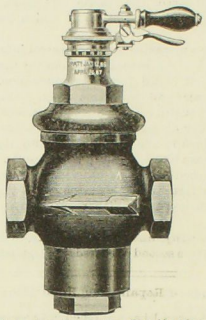
H. Burkhardt, General Western Agent of the Standard Steel Casting Co., has removed his office to Room 15 Quincy Building, cor. Clark and Adams streets, Chicago, Ill.

The Hoyt Frog Co. have made several important improvements on their apparatus lately, and railroad men who have examined the frog consider that it is now all that can be desired to make an unbroken track. This frog dispenses with the dangerous guard rail, and substitutes a plain rail for the ordinary frog. A simple and efficient lock has been added lately which automatically secures the frog in position. It is in use on the Lehigh Valley and Atchison, Topeka & Santa Fe railroads, and is on exhibition in the Grand Pacific Hotel, Chicago.

The Mason Locomotive Reducing Valve, for Reducing Boiler Pressure on Steam Car Heating Systems.

The accompanying cut represents a new pattern of reducing valve designed and patented by the Mason Regulator Company, 22 Central street, Boston, especially for steam car-heating systems. It is often necessary for the locomotive engineer to set his valve for high pressure when the train first starts, in order to warm it quickly, and afterward to reduce it. The advantage of the lever, ratchet and self-locking arrangement over the ordinary key or wheel is obvious. There is need of a pressure gauge, as the different pressures are indicated on the valve, so that the engineer after a little practice can set or change his pressure even in the night time, and without consulting a gauge. There is no possibility of the jarring of the engine affecting the valve so as to change the pressure, as it is self-locking. The inside mechanism of the valve is practically the same as that of the ordinary reducing valve made by this company. It is warranted to be noiseless, not to steam cut, and not to stick.

The lever is so arranged that it can be placed in any relative



Reducing Valve for Car Heating.

position with a given pressure in the system. These valves are made of the very best steam metal obtainable, and are made very stocky, so that there is no danger of the body becoming sprung or twisted, thus causing the valve to stick. A sample valve will be sent to any railroad desiring to test it.

Color Blindness among Railroad Employes.

BY WILLIAM THOMSON, M. D.,

Professor of Ophthalmology in the Jefferson Medical College of Philadelphia.

The following paper was lately read before the American Association for the Advancement of Science in New York:

The conflict between the officers and the employés of the Reading Railroad, which has occupied recently the attention of the public, and has threatened to produce a suspension or work on that road, has reopened the question of color blindness among railroad employés, and led to a full demonstration of its existence among those engaged even as enginemen, where the defect might lead to serious accidents, with loss of property and life. The officers of the road have selected the system for examination suggested by the writer, and employed to a full success for more than five years past on the Pennsylvania Railroad, and have appointed me to supervise its details, and, as ophthalmological expert, to decide all doubtful cases after careful examination of those found defective by the non-professional examiners of the company.

The conflict is nearly over, since demonstrations of the optical defect in engineers, made before a committee appointed by the employés have satisfied themselves of the propriety of the testing, and that the safety of the traveling public demands the removal of all color blind persons from positions where their optical defect might be the cause of distressing accidents. In the recent demonstrations I was able at my office to show that an engineman declared a red danger signal, made by placing red glass in front of a large gas light at a distance of two feet away, to be a green light; he was also not only unable to distinguish a red from a green flag within six feet, but he failed to classify the flags, white, red, green and blue properly, even when allowed to take them in his own hands.

The system adopted by the Reading Railroad is the one in use on the Pennsylvania Railroad, and owes its value to the fact that large bodies of employes can be brought under inspection, and their defects discovered by non-professional examiners.

Previous to its adoption by the officers and directors of the Pennsylvania Railroad two thousand men were examined, and their blanks submitted to me, and the color-blind men sent to my office for final action. Mr. Pugh, general manager, stated in September, 1884, that there were thus detected four per cent. of men color blind, and ten per cent. of men deficient in acuteness of vision, and that, although it was very difficult to keep accurate notes of all examinations, he was satisfied that all dangerous persons had been removed up to that date, when over twelve thousand employes had been submitted to the system.

The statistics obtained upon the two thousand men were used as the standard by all the Division Superintendents, and however difficult it might be to report to the central office the full details of their examinations, they were always controlled by these known and accepted ratios. It has not been found requisite to send all men deficient to the ophthalmological expert, since they did not demand it, but submitted to the changes rendered necessary without opposition, hence I am unable to furnish exact reports of the examinations made at remote portions of the road. Most of the color-blind men have passed under my hands, as well as many cases of astigmatism, optical defects, and diseases or injuries reducing the sight below the standard, and the results may some time be found worthy of publication.

An opportunity to present the last opinions of the officers of the Pennsylvania Railroad has been afforded by a request which was made by the German Government, through its Minister, to the Surgeon-General of the United States Army for statistical and other information on the subject, and this letter, referred to me by the Surgeon-General, has been answered by Mr. Pugh, who has kindly made efforts to obtain the figures from the great organization of which he is general manager. He writes, under date of July 7, 1887, and says:

"I regret that so long a time has elapsed since the receipt of yours of May 25 and this reply. The delay has been occasioned by our efforts to obtain some statistical information, which I regret to find has not been kept up as closely as was intended. I inclose herewith statements showing the number of employés examined during the past five years, with the results stated.

"I can only add that we have attained the most satisfactory results from the system, and I think we can confidently claim that sense of security which follows the belief that we have no one employed in any position in which the use of signals is required, whose color-sense and sense of vision will not enable him to accurately determine all signals by which his action is governed."

Total number examined on lines east of Erie	25,158
Color blind	481
Defective vision	661
Hearing	158

I am informed that the system has been found so satisfactory that it has been extended to the lines west of Pittsburgh, and no doubt is now in use throughout all the lines controlled by the Pennsylvania Railroad, embracing 7,000 miles of track, with over 100,000 employés.

It will be remembered that this system is also used to prevent the admission of defective men into the service, and that the apparently small percentage of color blind in this table may be ascribed to the non-application of men who know their deficiency, and to the fact that men in the service knowing their defect would leave the road before examination, and thus escape detection, and be enabled to gain employment on other roads, where no examinations are required. Perhaps twelve or thirteen thousand was the number who were subject to examination by virtue of being in positions where color signals were used to direct them in 1884, and the difference between that number and the total 25,000 would be made up of new men, who would present a small ratio of those below the standard, since men conscious of color blindness, or poor sight, would not apply.

The fact that the intelligent officers of the Pennsylvania Railroad have adopted this system, purged their old force of all dangerous men, extended its use to all parts of their immense railroad, and now oppose it as a barrier to the admission of men thus unfit for service, is the best evidence that can be adduced to claim for it a successful place among the efforts to render scientific truths of practical value to the world. It is hoped that the Reading Railroad will be sustained in its contest with its employés by the example so quietly conducted by the Pennsylvania Railroad, and that the reform so necessary for the traveling public and for those employés who carry their lives in their hands daily, may be conducted to a happy finish.

Our Directory.

We note the following changes since our last issue. Our readers will do us a great favor by giving us prompt notice of any changes that may come to their knowledge or of any errors that may be noticed in our list:

Baltimore & Ohio.—Mr. J. F. Legge has been appointed Superintendent of the Western Division, vice Mr. C. Dunlap, resigned.

Thos. S. Prince has been appointed Acting Superintendent of the Harper's Ferry & Valley Division, vice Mr. A. Gordon Jones, resigned.

Burlington & Missouri River.—Mr. C. B. Rogers, Assistant Superintendent Wymore; Mr. E. Bignell, Assistant Superintendent, headquarters at Aurora; Mr. J. R. Phelan, Assistant Superintendent at Holyoke.

Canadian Pacific.—T. A. Mackinnon has been appointed General Superintendent of the Southeastern Division.

Central Iowa.—Mr. M. C. Wheeler is appointed Master Mechanic in place of Mr. John Plazer, resigned.

Chicago, Burlington & Northern.—William E. Green has been appointed Assistant Superintendent, headquarters at La Crosse, Wis.

Chicago, Kansas & Nebraska.—Mr. M. E. Wattles has been appointed General Superintendent.

Lake Erie & Western.—General manager Bradbury announces that Mr. H. L. Cooper having tendered his resignation as superintendent of equipment, Mr. P. Reilly is appointed to that office, and will have charge of the motive power and car equipment of this company, with office at Lima, Ohio.

Lake Shore & Michigan Southern.—T. F. Whittelsey has been appointed Superintendent of the Kalamazoo Division, vice M. E. Wattles, resigned.

Louisville, New Orleans & Texas.—Benjamin Wilson, formerly receiver of the Mobile & Northwestern, has been appointed Superintendent of this company; office at Memphis, Tenn.

New York, Pennsylvania & Ohio.—Washington Lavery has been appointed Master Mechanic at Galion, vice C. J. Clifford, resigned. D. S. Dockstader has been appointed General Foreman of Car Repairs, vice S. V. Smith, resigned.

Peoria, Decatur & Evansville.—Mr. Frank E. Smith has been appointed Master Mechanic in place of P. Reilly, resigned.

Toledo, St. Louis & Kansas City.—Mr. S. R. Callaway has been elected President.

Wisconsin Central.—John Player has been appointed Superintendent of Motive Power, to succeed H. A. Barnes. Thomas Clifford has been appointed Superintendent of the St. Paul Division, vice C. F. Waldo, who is transferred to the Middle Division, with headquarters at Stevens Point, Wis. P. Walling, who is now Superintendent of the Middle Division, will take charge of the Bridge Department.